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REPORT
OF THE
SECRETARY OF AGRICULTURE;

BEING PART OF
THE MESSAGE AND DOCUMENTS

COMMUNICATED TO THE
TWO HOUSES OF CONGRESS
AT THE
BEGINNING OF THE FIRST SESSION OF THE FIFTY-FOURTH CONGRESS.



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REPORT

OF THE

SECRETARY OF AGRICULTURE.

Mr. PRESIDENT:

The Secretary of Agriculture has the honor to submit his Third Annual Report. It is a statement of the doings of the United States Department of Agriculture during the fiscal year ended June 30, 1895. It will show wherein expenditures have been reduced for the sake of economy, and wherein they have been increased for the sake of efficiency.

BUREAU OF ANIMAL INDUSTRY.

MEAT INSPECTION.

Meat inspection during the fiscal year increased and improved. The public demanded more extended and critical inspection in all the great cities where the larger abattoirs are located. Earnest efforts were made by the Department to inspect all animals slaughtered for interstate and foreign trade. Those efforts, however, have been made only in the cities where United States inspection has been permanently instituted. At such killing places calves and sheep have been included in the inspection.

The number of animals inspected at slaughterhouses during the year was 18,575,969. During the preceding year only 12,944,056 were inspected. This shows 5,631,913 more this year than last. The work, therefore, of inspection at the abattoirs during the fiscal year ended June 30, 1895, was augmented by about 43 per cent. During the same year, in the stock yards, ante-mortem inspection was also made of 5,102,721 animals.

By order of the President of the United States, inspectors were placed in the classified service on July 1, 1894. Since that time the number of those officers has been largely reenforced from the list of eligibles recorded in the office of the United States Civil Service Commission. All inspectors thus appointed are graduates of reputable

veterinary colleges and have passed satisfactory examinations in veterinary science before the Civil Service Commission. Therefore the educational acquirements of the corps of inspectors are of so high a grade that meat and animal inspection must become of great sanitary value to consumers at home and to interstate and foreign commerce, provided State and municipal authorities intelligently and diligently cooperate with those of the National Government. If such cooperation fails, then the people of the great killing centers become the consumers of all rejected animals and meats. The protection of domestic health will be much improved when each purchaser of meats demands and insists upon that which has been governmentally inspected and certificated.

Had not the whole matter of animal and meat inspection better be relegated to State and municipal authority. When and where will the duties of the Bureau of Animal Industry otherwise be defined and restricted? And what will be ultimately the annual appropriation of money required to compensate its constantly increasing force of inspectors, assistant inspectors, stock examiners, and taggers?

But whether inspected by national or State authorities, the owners of the animals and carcasses inspected should pay for the service which confers an added selling value to their commodities.

During the year this inspection cost 1.1 cents per animal inspected. The aggregate sum paid out for that service was \$262,731.34.

In 1893 inspection cost $4\frac{3}{4}$ cents per animal. In 1894 it cost $1\frac{3}{4}$ cents per animal.

This service has been maintained during the year at 55 abattoirs, situated in 18 cities. During the previous year inspection was conducted at only 46 abattoirs and in 17 cities.

MICROSCOPIC INSPECTION OF PORK.

During the fiscal year 1895, 45,094,598 pounds of pork were examined microscopically and exported, while during the year 1894 only 35,437,937 pounds went abroad, and in 1893 only 20,677,410 pounds of microscopically examined pork were exported.

And notwithstanding the agrarian protectionists of Germany, who have instituted by unjust discriminations every possible impediment to the consumption of pork and beef from the United States in that Empire, 29,670,410 pounds of microscopically inspected hams, bacon, and other cured swine flesh were exported directly to that country; while France, which is intermittently discriminating against us, took 9,203,995 pounds of the same product; Denmark, 472,443; Spain, 4,752; and Italy, 3,630. Indirectly Germany and France probably received much more American bacon and hams than can be estimated from data at hand; but the amounts set down for those two countries were sent directly to German and French ports, and can be verified by the records of the Department of Agriculture.

Reciprocal certification of the chemical purity of wines exported from those countries to the United States may some time be demanded from the German and French Governments as a sanitary shield to American consumers, for certainly American meats are as wholesome as foreign wines.

In the fiscal year 1895, 905,050 hog carcasses and 1,005,365 pieces of swine flesh were microscopically examined. This shows a total of 1,910,415 specimens placed under the microscope. The cost of this was \$93,451.10. The cost of each examination was therefore 4.9 cents. In 1893 the same examination cost $8\frac{3}{4}$ cents per specimen, and in 1894, $6\frac{5}{9}$ cents.

The foregoing statement shows a reduction of 25 per cent in the cost of inspection in 1894, compared with the inspection of 1893; it shows likewise a reduction of 25 per cent in 1895, compared with 1894. This inspection cost for each pound of meat in 1894, $2\frac{48}{100}$ mills, and in 1895 it cost 2 mills per pound.

INSPECTION OF LIVE ANIMALS FOR EXPORTATION.

During the year 657,756 cattle were inspected for the export trade and in 1894, 725,243.

The United States actually exported during the fiscal year 1895 324,299 head, but in 1894 they sent out 363,535. This shows a falling off of exported cattle during the fiscal year 1895 of 39,236 head, compared with the year 1894.

Out of all the cattle inspected, 1,060 were rejected during the year 1895, while only 184 were rejected during the year 1894.

The number of sheep inspected for exportation in 1895 was 704,044. The number really exported was 350,808. In 1894 only 85,809 were sent abroad. Therefore, there was in the year 1895 an increase of 264,999 exported sheep. This increase is over 300 per cent.

The foregoing statement shows that, taking cattle and sheep together, 1,361,800 animals were inspected in the year for foreign markets. It also shows that out of that number a total of 675,107 animals were shipped abroad.

Every bovine animal was tagged and numbered. Each number was registered so that individual animals could be identified. All the cattle were certified to be free from disease.

DANGERS AND DIFFICULTIES OF SHEEP SHIPMENTS.

Sheep, although healthy when exported, sometimes become affected with scab while on shipboard. Large numbers of sheep crowded together in a vitiated atmosphere are conducive to the speedy development of scab. In case any of the parasites of that disease are present the symptoms of scab are rapidly developed during the voyage. Flocks carefully examined and found entirely free from any symptoms of

disease at the time of embarkation are sometimes found badly affected with scab when landed. Prolonged and diligent study has been given to provide measures to prevent infection with this disease. It is probable that some of the sheep are infected in cars which have previously carried diseased animals. Others are infected in stock yards, while others may be infected in the ships themselves. It is evident that to guard against all these sources of infection comprehensive regulations are required for the disinfection of cars, stock yards, and ships, and, furthermore, that inspection must be so rigorous and specific as to prevent the sale by growers and feeders of diseased sheep to be placed on the market.

VESSEL INSPECTION.

All vessels in the export cattle and sheep trade have during the year been thoroughly inspected by officers of the Bureau of Animal Industry. That inspection was made in accordance with the act of Congress approved March 3, 1891. Revised regulations have been issued embodying the amendments suggested by actual experience since that law came into vigor.

The losses of live animals exported from the United States during the year have been heavier than usual. An investigation has therefore been commenced to determine whether any part of these losses was due to noncompliance with the regulations of this Department. Great Britain found that out of the 294,331 head of American cattle shipped to England, a loss was incurred while in transit of 1,836 head; that is, 0.62 per cent, as compared with 0.37 per cent in 1894.

The number of sheep inspected after landing in Europe was 310,138. There had been lost in transit 8,480 head—that is, 2.66 per cent—in 1895. In 1894 the loss was 1.29 per cent.

STOCK YARDS INSPECTION.

Stock yards inspection is to prevent the spread of contagious diseases through interstate and foreign commerce. Texas fever is the only disease thus far absolutely controlled by this inspection. The further development and improvement of its active force in the field will enable the Bureau to finally include hog cholera, tuberculosis, sheep scab, and other diseases in its examinations of domestic animals in market.

QUARANTINE SEASON AGAINST TEXAS FEVER.

From February 15 to December 1, 1894, there were received from the infected cattle districts and inspected at quarantine pens 30,531 cars of cattle. Those cars carried 826,098 animals.

During the same period 8,958 carloads of cattle were inspected in transit, and 28,650 cars were cleaned and disinfected under the supervision of inspectors. During the same time there were also inspected 156,660 cattle from the noninfected district of Texas, which had been

shipped or driven to Northern States for feeding purposes. The identification of the branding of all those cattle was necessary. That determined whether they could be with safety grazed and fed in the North.

COST OF TEXAS FEVER AND EXPORT INSPECTION.

Inspection to guard against Texas fever in interstate and foreign trade cost \$104,492.46. Assuming that half of that sum should be charged to the inspection of export animals, the cost of inspecting 675,107 head of animals (cattle and sheep) exported would be \$52,246.23, just 7.74 cents per head. During the preceding year the per capita cost, computed in the same way, was 10.75 cents. The number of individual animals inspected in this country was 1,361,800, and 604,469 were inspected in Great Britain. This makes a total of 1,966,269 animals. Thus the average cost of one inspection for each individual animal was 2.66 cents.

INSPECTION AND QUARANTINE OF ANIMALS IMPORTED INTO THE UNITED STATES.

During the year the United States imported, quarantined, and inspected at the Garfield Station, in New Jersey, 142 head of cattle, 23 swine, and 3 moose, besides 9 cattle from India; at Littleton, near Boston, Mass., 12 sheep were quarantined and inspected; at Buffalo, N. Y., 366 cattle, and at Port Huron, Mich., 1 bovine. Altogether 702 imported animals from Europe were quarantined for the prescribed period and inspected.

ANIMALS FROM CANADA.

During the same period 293,594 animals were imported from Canada, but not subject to quarantine, as follows: 292,613 sheep, 908 swine, 48 head of cattle, and 5 moose.

CATTLE FROM MEXICO.

From January 1, 1895, to June 30, 1895, 63,716 head of inspected cattle came into the United States from the adjacent Republic of Mexico. All of that number of animals were critically examined and passed upon by the employees of the Bureau of Animal Industry. No diseases were found among them. Their sanitary condition was, as a rule, most excellent, and their weights showed an improvement in breeding, while some animals were of very high grades.

It is suggested that if the duty were taken off Mexican cattle it would be of great advantage to the grazers of Texas and the feeders of Kansas, Nebraska, and other Northwestern States which have a surplus of corn to convert into beef. Should these cattle be let in free of duty, it would certainly not enhance the price of steaks and roasts to beef-eaters in the United States, who largely outnumber beef-producers.

SCIENTIFIC WORK OF THE BUREAU.

Researches by the scientists of the Bureau, directed by Dr. D. E. Salmon, its chief, have during the past year yielded satisfactory and valuable results. Investigations are now in progress, the objective points of which have not yet been attained, though there is reasonable ground to believe that conclusions may be reached which will prove of great value to the growers and feeders of domestic animals throughout the United States. For specific descriptions of the investigations here alluded to reference is respectfully and confidently made to the Report of the Chief of the Bureau of Animal Industry, which will record in detail the attempts to destroy Texas fever ticks upon and among Southern cattle by various insecticides. That report will disclose the amount of tuberculin and mallein sent out, upon application, to the proper authorities of the several States of the Union during the fiscal year.

DAIRY DIVISION.

The dairy division was organized July 1, 1895, with Major H. E. Alvord as chief, with an assistant chief, and two clerks. Its work for some time to come will be largely confined to the collection and dissemination of information relative to dairying as carried on in the United States and some foreign countries. Original scientific research bearing upon this branch of rural industry will necessarily be postponed until proper foundations have been laid therefor out of the experiences and observations that at present are being collected. It is hoped that this division will prove of great educational advantage to the farmers of the country. It is not reasonable to expect from the division anything more than practical didactics. It is not the province of this division, or any other in the United States Department of Agriculture, to do more than plainly instruct people in the various branches of farming how to intelligently help themselves.

During the fiscal year the Bureau of Animal Industry issued many reports, bulletins, and circulars which have been in great demand among the editors of agricultural periodicals and the intelligent farmers of the United States.

The appropriation for the Bureau for the year ended June 30, 1895, was \$800,000. Out of that sum less than \$533,000 has been expended. The balance to be returned to the Treasury of the United States will, when the year's accounts are finally closed, exceed \$250,000.

FOREIGN MARKETS FOR AMERICAN MEAT PRODUCTS.

Cheap swine feed throughout the Kingdom of Great Britain during the past year caused a large increase there in home-fattened pork. The British farmer, even at the present low price of bacon, finds it more profitable to fatten hogs than to market beans, pease, and cereals. The

number of breeding sows in Great Britain increased over 100,000 during the year. That was an advance of more than 64 per cent. The number of other swine increased 430,314. This was an advance of more than 21 per cent. The total number of swine in Great Britain on the 4th day of June, 1895, is officially stated at 2,884,431.

The British swine flesh increase helped materially to depress the market for imported meats. Therefore prices averaged considerably lower during the year 1895 than in the year 1894. But the September prices of the year 1895 were not lower than those of the previous year. The Wiltshire packers, at Calne, England, are paying 9½ cents per pound for hogs on foot not exceeding 150 pounds in weight, and not carrying more than 2½ inches of fat on the back. Heavier weight hogs bring smaller prices. English packers invariably pay a premium for swine precisely adapted to making the kind of bacon most in demand—that is to say, lean, thin, and mildly cured. The call for this sort of meat throughout Great Britain has caused a change in the breeding of swine throughout almost the entire realm. The Tamworth hog is now in more request than the Berkshire, Essex, or any other established breed. The farmers and packers of the United States must study and cater to foreign desire and demand in this respect if they propose to secure and hold at a profit their share of the foreign markets.

During the past summer there was a very considerable advance in the price of the bacon offered in the English market from Canada, from the Continent, and from the English abattoirs. This rise was brought about by a temporary shortness of bacon supplies, but United States bacon did not participate to any appreciable extent in the general advance, for the reason that as prices went up consumption was checked and imports were increased, so that there came to prices a speedy decline. Competition, in supplying bacon to European markets, is increasing from year to year because of the increasing number of packing houses upon the Continent. Danish bacon is constantly growing in favor with the European consumers. The shipments of that meat from Denmark during the seven months ended July 31 last were increased 9,049,600 pounds, compared with the shipments for the parallel period of the year 1894, notwithstanding the Danes received, because of a low-priced market, less money for the increased quantity by nearly \$250,000 than the previous year yielded.

The shipments of United States bacon increased in that time 15,680,000 pounds. But it brought less money by \$1,000,000 than the shipments of the year 1894. During the same time Canada received a less sum of money for an increased exportation of bacon to Europe.

Modern methods of skillfully preparing and preserving great varieties of meat and vegetable foods of all kinds keep European and all other markets almost constantly supplied with a great variety of palatable and wholesome edibles. Moreover, the rapidity with which the United States and parts of Europe can respond to any unusual demand

for bacon and other pork products renders it improbable that there will be any considerable and permanent advance in the prices of hog products during the immediate future. But if there should come an advance, it will, it is reasonable to conclude, be maintained only temporarily. American packers can only obtain and hold English and other European bacon markets by specially preparing their meats to meet the taste and demand of those markets. Smaller and leaner swine for bacon purposes are demanded in nearly all foreign markets. And the meat must be mildly cured. But in Mexico and some of the South and Central American States the heaviest, fattest, and thickest sides are required.

The American packers who will cure bacon as above described for European consumption and maintain a high quality for their brands will find a reward not only in European but in the home markets, for it is a fact that each year limited quantities of English bacon are shipped uninspected to New York and Boston grocers, who retail it at high figures to fastidious customers. It is considered a luxury at some American breakfast tables, though no inspection has been demanded or imposed by the United States.

The following tables will be of interest to American producers and consumers alike:

Wholesale prices of bacon and hams in London.

BACON.

[Per 100 pounds.]

Product.	September, 1895.	Same time last year.	July, 1895.	Same time last year.
Irish.....	\$12. 85-\$13. 50	\$13. 00-\$13. 40	\$9. 75-\$12. 37	\$13. 03-\$15. 20
English.....	14. 09 15. 10	14. 00 17. 00	10. 42 11. 72	14. 11 16. 29
Continental.....	9. 69 14. 11	10. 85 13. 25	9. 33 11. 72	12. 00 14. 77
American (middles, short ribs)	8. 25 8. 68	9. 54 10. 50	7. 37 7. 81	8. 68 9. 54
Cumberland cut	9. 11 9. 54	9. 54 9. 98	7. 37 7. 81	8. 25 9. 98
Singed sides	9. 54 9. 98	9. 11 9. 98	6. 94 7. 37	9. 54 9. 98
Canadian	10. 50 11. 28	10. 00 11. 28	9. 11 9. 98	10. 85 11. 71
Legs, green	9. 11 11. 71	12. 50 13. 00	10. 64 12. 25	12. 58 13. 09

HAMS.

Irish.....	\$17. 33-\$22. 00	\$15. 70-\$21. 50	\$15. 64-\$20. 41	\$16. 53-\$21. 28
Cumberland	17. 33 19. 50	18. 00 21. 75	17. 33 21. 73	17. 78 21. 73
American:				
Long cut	9. 54 10. 25	11. 60 12. 60	.....	.....
Short cut	8. 68 10. 25	11. 50 12. 40	.....	.....

Imports of bacon into the United Kingdom during the first seven months of 1895, with comparisons with a similar period in each of the two previous years.

From—	Quantities ¹ for seven months ended July 31—			Values for seven months ended July 31—		
	1893.	1894.	1895.	1893.	1894.	1895.
Denmark.....	400, 491	474, 335	555, 179	\$5, 905, 405. 28	\$6, 737, 489. 18	\$6, 505, 206. 26
Germany.....	8, 595	211	15	127, 307. 64	3, 031. 82	187. 79
Canada.....	39, 374	85, 413	86, 607	513, 493. 60	854, 275. 14	775, 267. 51
United States.....	1, 211, 448	1, 539, 628	1, 681, 340	14, 933, 090. 70	14, 931, 940. 34	13, 924, 204. 98
Other countries.....	59, 242	50, 890	73, 422	760, 580. 41	657, 483. 61	904, 521. 75
Total.....	1, 719, 150	2, 150, 477	2, 396, 563	22, 239, 877. 63	23, 184, 220. 09	22, 109, 390. 29

¹ In hundredweights of 112 pounds.

Imports of hams into the United Kingdom during the first seven months of 1895, with comparisons with a similar period in each of the two previous years.

From—	Quantities ¹ for seven months ended July 31—			Values for seven months ended July 31—		
	1893.	1894.	1895.	1893.	1894.	1895.
Canada.....	13, 822	19, 150	35, 987	\$260, 766. 03	\$231, 324. 18	\$388, 117. 97
United States.....	510, 460	629, 701	764, 376	7, 564, 365. 93	7, 378, 397. 50	8, 238, 478. 37
Other countries.....	6, 402	2, 534	2, 103	99, 373. 93	41, 204. 65	32, 006. 97
Total.....	533, 684	651, 385	802, 466	7, 924, 505. 89	7, 650, 926. 33	8, 658, 603. 31

¹ In hundredweights of 112 pounds.

Imports of pork into the United Kingdom during the first seven months of 1895, with comparisons with a similar period in each of the two previous years.

Product.	Quantities ¹ for seven months ended July 31—			Values for seven months ended July 31—		
	1893.	1894.	1895.	1893.	1894.	1895.
Salted (not hams):						
From United States....	56, 295	84, 675	82, 034	\$514, 841. 63	\$700, 099. 55	\$564, 927. 64
From other countries..	41, 131	44, 663	47, 366	242, 064. 57	302, 175. 58	262, 124. 28
Total.....	97, 326	129, 341	129, 400	756, 906. 20	1, 002, 275. 13	827, 051. 92
Fresh:						
From Holland.....	60, 251	51, 905	114, 179	696, 347. 48	591, 221. 35	1, 268, 526. 21
From Belgium.....	14, 613	15, 240	14, 419	176, 454. 42	186, 284. 75	173, 476. 12
From other countries..	19, 078	14, 921	8, 513	257, 423. 24	198, 013. 01	74, 681. 30
Total.....	93, 942	82, 066	137, 111	1, 130, 225. 14	975, 519. 11	1, 516, 683. 63

¹ In hundredweights of 112 pounds.

Imports of lard into the United Kingdom during the first seven months of 1895, with comparisons with a similar period in each of the two previous years.

From—	Quantities ¹ for seven months ended July 31—			Values for seven months ended July 31—		
	1893.	1894.	1895.	1893.	1894.	1895.
United States.....	631, 884	834, 028	1, 067, 646	\$8, 072, 954. 11	\$8, 068, 525. 60	\$9, 040, 550. 57
Other countries.....	21, 658	11, 622	10, 476	282, 359. 19	113, 540. 29	97, 334. 86
Total.....	653, 542	845, 650	1, 078, 122	8, 355, 313. 30	8, 182, 065. 89	9, 137, 885. 43

¹ In hundredweights of 112 pounds.

Wholesale prices of lard in London.

[Per 100 pounds.]

Product.	September, 1895.		Same time last year.		July, 1895.		Same time last year.	
Irish:								
Bladders.....	\$8.68	\$10.85	\$10.85	\$12.79	\$7.81	\$11.07	\$10.42	\$12.25
Kegs.....	8.00	8.50	9.50	10.25	7.81	8.25	8.90	9.54
English.....	10.25	10.85	11.75	12.25	9.98	10.42	11.07	12.00
Continental.....	7.70	8.68	11.28	11.50	8.25	9.11	10.85	11.07
American.....pails..	6.93	7.15	10.15	10.35	7.37	7.49	8.48	8.68
Compound, or lardine.....	5.63	5.85	7.60	8.48	5.96		6.08	6.56

CATTLE AND MEAT TRADE WITH GREAT BRITAIN.

In June, 1895, English farmers carried 4,500,000 head of cattle. Three years before the same farmers owned 5,000,000 head. Thus a decline of 10 per cent is shown in thirty-six months.

In Scotland, in June, 1895, there were 1,178,000 cattle; in Wales, 704,000, and at the same time Ireland contained 4,358,000. Thus the total for the United Kingdom, in June, 1895, is about 10,750,000 head. But the United Kingdom is not holding its proportion of the trade as a purveyor of meat to its own people. Up to the present year the United States and Canada have had an unquestioned monopoly in the supply of imported live cattle to the British people; but now there is vigorous and growing competition from Argentina and also incipient competition from Australia.

The bulk of American shipments must be classed as first quality. The London average price for the six months ended August 31, 1895, for prime cattle was \$8 per 100 pounds on foot; the Liverpool average, \$7.43; the Newcastle average, \$7.62; and the Edinburgh average, \$7.59. It is, however, only when we are dealing with live weights—that is to say, when the cattle are passing wholesale into first hands on the other side of the Atlantic—that we are able to detect any considerable difference between quotations for American beef and those for English or Scotch beef. During the first six months of this year domestic beef sold in Liverpool by the carcass at from \$8 to \$11.50 per 100 pounds. During the same time beef from the United States sold by the carcass at from \$10 to \$10.75 per 100 pounds. The Liverpool prices include all grades of domestic cattle. But shipments from the United States are picked lots. Our prices did not, therefore, decline to within \$2 of the Liverpool minimum, but the Liverpool maximum price exceeded ours by three-fourths of a cent per pound.

However, only a limited number of very fine carcasses were sold at top Liverpool prices, while a fair average of United States steers reached the maximum of \$10.75 per 100 pounds. Therefore, American carcasses, sold in Liverpool, approximated the same prices that English, Irish, or Scotch brought in the same market. The fact that a

large number of Irish and some Scotch cattle are slaughtered at the Liverpool abattoirs, and that Liverpool's domestic trade is not subject to the same conditions which control the import trade from the United States should not be lost sight of. To illustrate, prices at Birkenhead are sometimes considerably depressed by the simultaneous arrival of carcasses of cattle from Canada and the United States, while domestic prices at the Liverpool abattoirs are not thereby in the slightest degree affected.

During the nine months of the year ended with last September, at the great central meat market in London, the prices of prime Scotch and English beef compared with the prices of American as follows: Scotch sides, \$11.25 to \$14.62½ per 100 pounds; English prime, \$11.25 to \$12.87½ per 100 pounds; American, \$9 to \$11.50 per 100 pounds. The extremely hot weather of September lowered all prices, and the high temperature of that month is wholly responsible for the minimum quotation of \$9 per 100 pounds for American beef. Up to the beginning of September the lowest price during the year had been \$10.50 per 100 pounds. Top prices in London are only paid for the finest beef of the world. But the minimum prices of that city do not by any means represent the poorest quality. That finds a more profitable market elsewhere. The top prices for American beef in London are, as a rule, about equal to the bottom prices for the best Scotch and English beef. When United States meat is selling from \$10 to \$11 per 100 pounds the Scotch and English are usually bringing from \$11 to \$14 per 100 pounds. Of course, these prices refer exclusively to the wholesale market and dealings. The apparent disparity in values disappears when the beef reaches the retailer.

A Birkenhead-killed American side reappears in the retail market as "prime Scotch," while a Deptford-killed United States steer masquerades as "prime English beef." The British consumer is unable to detect, either by eye or palate, the origin of a side of beef or the roast cut from it. Thus far all attempts to identify and establish the nativity and fattening places of meats in English markets have failed. British consumers learned long ago that they had been thoroughly and completely deceived by buying American for Scotch and English beef. The conclusion drawn from said successful and nutritious deception is that American beef is as good as any in the whole world. The complaint now made by consumers is merely that the retailer does not allow them to participate in the profits which he makes upon United States beef over and above those which he pockets upon Scotch and English of the same or similar quality.

The report of the London Central Market, just issued, states that of the 341,000 tons of meat received there in 1894, 71,638 tons were American (this includes the relatively small quantity shipped from Canada), and 49,908 tons came from Australia and New Zealand. The United States and Canada will not be able in 1895 to show that they

have supplied 20 per cent of the meat entering the great London market, and it may be a long time before they will repeat the figures of 1894. During the present year, however, steadier trade and prices have been quite satisfactory to American shippers and far more productive of profits than were the flurries and fluctuations of last year. Cattle in Great Britain from the United States represent more than 68 per cent of all its beef importations. During the year United States beef carcasses have exceeded in price those from Canada by 25 cents per 100 pounds.

Argentina during the first eight months of 1893 sent to Europe 5,643 head of cattle. During the same period of 1894, 7,831 head were exported, and during a corresponding period in 1895, 25,165 head. The shipments of this year were valued at \$9,181,000. Thus they were priced on the other side of the Atlantic at \$78.72 per head, that is \$6.71 less than the declared value per capita of cattle from the United States. But this difference in price inadequately represents the decided difference in quality. South American cattle are coarser than ours, and the meat is not so salable in the English market. Prices of Argentine beef per carcass range from \$1 to \$2.50 per 100 pounds less than those paid for North American cattle. There is, however, no doubt that the Argentine shipper can make a profitable business at the prices named, and from year to year shipments from that Republic will continue and increase. Argentina is the most formidable beef-selling competitor of the United States in the world's markets.

Australia made the first large shipment of live animals from the Antarctic continent on the steamship *Southern Cross*, 5,050 tons registered, which arrived at London from Sydney on the 10th day of September, 1895, laden with cattle, sheep, and horses. This steamship came by way of Montevideo. That route was taken to avoid the heat of the Red Sea. The voyage occupied two months. During that time 52 cattle, 82 sheep, and 1 horse were lost. The shipment originally was made up of 550 cattle, grade Herefords and Durhams; 488 sheep, which were cross-breeds and Merino wethers, and 29 horses, the whole in charge of 30 men. The freight upon the cattle and horses was \$39 a head, and the freight rate upon each sheep was \$2.50. This Department is credibly informed that the freight, insurance, fodder, and attendance amounted to \$68.25 for each horse and each beef animal, and to \$6 for each head of sheep. The value of the cattle at Sydney was \$20 a head; therefore they stood the shipper, upon arriving at Deptford, where they were sold, \$88 apiece.

The condition of the animals was fair, as those which had been selected for the experiment were very large and coarse, the idea being that it cost no more to send a large steer than a small one. The prices realized were a great disappointment to the shippers and were entirely inadequate to recoup them. It is therefore generally admitted in England that the experiment resulted in a very considerable loss.

However, it is by no means certain that further experiments will not be made, nor can Americans congratulate themselves upon having no competition in the future from Australian cattle and their products in the markets of Europe. Frozen beef from that country will continue to be placed (although it is admitted to be of inferior quality) in European markets. But it is charged that out of the Australian cattle which arrived on the *Southern Cross* and were killed at Deptford 12 were found to have contagious pleuro-pneumonia.

Shipments of chilled beef from the United States fell off during the first eight months of the present year 11,000,000 pounds, but increased over the corresponding months of 1893 by about the same number of pounds. The high quality of beef shipped to Europe from the United States has been steadily maintained and appreciated by remunerative and profitable prices. Refrigerated hind quarters sold during the year from \$10.50 to \$13.50 per 100 pounds. The maximum price has been considerably above the top prices at any time obtainable for beef from American cattle killed upon landing at the abattoirs of either Deptford or Birkenhead. Naturally it seems that the shipments of chilled beef should rapidly increase and cause a decline and impairment of the live-cattle trans-atlantic trade. Nevertheless, it appears to work out more profitably to transport the live cattle. They are carried on parts of the ship that would otherwise be unoccupied. They do not require such special fittings and appliances as to debar the vessel from carrying other cargoes when cattle are not available.

Shipments of frozen beef from the antipodes may possibly become more common in English markets. But after it is defrosted it is unsightly in appearance, lacks flavor, and is repulsive when served in the English method as a "cold joint" the second day after cooking. Australian hind quarters have sold from \$6.50 to \$7 per 100 pounds throughout the present year, up to September 1, at the Central Market in London. That is only a trifle more than half the prices quoted for American refrigerated hind quarters.

AMERICAN CATTLE IN GLASGOW.

During the year ended May 31, 1895, there were only 26,426 cattle from the United States landed at Glasgow. From June, 1879, to the 31st day of May above mentioned, American cattle landed at Glasgow numbered 337,627 animals. As a rule the cattle arrived there in good condition. The authorities of Glasgow make no discriminations against American live stock when compared with that from Canada. Animals from both countries are, by law, slaughtered within a certain number of days after landing. The average prices realized in Glasgow for cattle from the United States have been about 1 cent less than those, obtained for Scotch cattle. The latest sale held at Yorkhill, Glasgow on September 30, 1895, was of 384 United States animals, which

realized, for 266 steers, from \$62 to \$85 and \$115 each, and 32 bulls, which sold per head from \$50 and \$65 to \$96.

Approximately the dead-weight quotations for the animals were: Best quality of steers, \$12.15 per 100 pounds; heavy prime steers, \$11.71; rough, secondary animals, \$11; and at the same market, five days before—that is, on September 25—top Scotch cattle sold at \$13 to \$13.70 per 100 pounds; secondary, \$12.37 to \$12.80; third quality, \$8.45 to \$10.20; middling and inferior, \$5.42 to \$7.80. The bulk of the meat from American cattle sold at Glasgow is cut and retailed without any distinctive reference as to where it originated. In that city there are comparatively few retail dealers who sell Scotch beef exclusively. Those few retailers demand higher prices than those asked by dealers offering both Scotch and American meats. American cattle in the Scotch markets are looked upon as far superior in grade and quality to Irish cattle; in fact, they are regarded as next to the best Scotch.

The following tables explain themselves:

Table showing the quantity and value of beef imported into the United Kingdom during the first eight months of the years 1893, 1894, and 1895.

Product.	Quantities ¹ for eight months ended August 31—			Values for eight months ended August 31—		
	1893.	1894.	1895.	1893.	1894.	1895.
Salted:						
From United States....	122, 327	150, 260	135, 381	\$780, 104. 81	\$1, 085, 837. 81	\$854, 630. 39
From other countries..	6, 284	5, 701	3, 355	54, 134. 93	38, 265. 28	24, 244. 90
Total	128, 611	155, 961	138, 736	834, 239. 74	1, 124, 103. 09	878, 875. 29
Fresh:						
From United States....	995, 746	1, 888, 399	1, 093, 299	10, 707, 195. 43	12, 293, 689. 03	11, 141, 934. 46
From other countries..	184, 648	215, 456	326, 972	1, 575, 811. 63	1, 575, 154. 65	2, 381, 626. 16
Total	1, 180, 394	1, 403, 855	1, 420, 271	12, 283, 007. 06	13, 868, 843. 68	13, 523, 560. 62
Meat unenumerated:						
From Holland.....	83, 865	74, 896	116, 833	917, 125. 98	796, 879. 64	1, 213, 919. 21
From United States....	13, 839	19, 097	21, 351	143, 332. 52	173, 943. 30	176, 736. 66
From other countries..	27, 905	30, 729	33, 098	319, 067. 19	359, 103. 89	335, 569. 50
Total	125, 609	124, 722	171, 282	1, 379, 525. 69	1, 329, 926. 83	1, 726, 225. 37

¹ In hundredweights of 112 pounds.

Table showing the quantity and value of meat, preserved otherwise than by salting, imported into the United Kingdom during the first eight months of the years 1893, 1894, and 1895.

Product.	Quantities ¹ for eight months ended August 31—			Values for eight months ended August 31—		
	1893.	1894.	1895.	1893.	1894.	1895.
Beef	239, 385	176, 724	302, 453	\$2, 829, 957. 33	\$2, 384, 891. 58	\$3, 657, 427. 80
Mutton	57, 050	77, 113	126, 569	523, 898. 18	658, 588. 24	1, 017, 536. 48
Other sorts	86, 666	98, 790	122, 138	1, 519, 506. 22	1, 591, 729. 95	1, 825, 448. 48
Total	383, 101	352, 627	551, 160	4, 873, 361. 73	4, 635, 209. 77	6, 500, 412. 76

¹ In hundredweights of 112 pounds.

The number and value of cattle imported into the United Kingdom during the first eight months of the years 1893, 1894, and 1895.

From—	Number for eight months ended August 31—			Values for eight months ended August 31—		
	1893.	1894.	1895.	1893.	1894.	1895.
Canada	54,600	48,920	54,262	\$4,751,700	\$3,979,000	\$4,463,000
United States.....	157,157	273,678	176,470	14,309,000	23,763,000	15,416,000
Argentina	5,643	7,831	25,165	433,472	580,000	1,981,000
Other countries.....	77	89	672	9,934	10,000	60,156
Total	217,477	330,518	256,569	19,504,106	28,332,000	21,920,156

Average wholesale prices of dressed meats at the London Central Meat Market, 1894-95.

[Per 100 pounds. Compiled from the Board of Agriculture returns and from the Meat Trades Journal.]

Beef.	First quarter, 1895.		Second quarter, 1895.		Third quarter, 1895.		Average for 1894.	
Scotch:								
Short sides	\$12. 12½	\$12. 87½	\$13. 12½	\$14. 12½	\$12. 12½	\$14. 62½	\$12. 62½	\$13. 62½
Long sides.....	11. 25	11. 75	12. 12½	12. 62½	12. 12½	13. 62½	11. 37½	11. 75
English prime.....	11. 25	11. 75	11. 75	12. 37½	11. 00	12. 87½	11. 12½	12. 37½
Cows and bulls	7. 75	9. 25	7. 25	9. 75	6. 00	10. 00	.....	.....
American:								
Deptford killed.....	10. 50	11. 00	11. 00	11. 50	9. 00	11. 50	9. 25	11. 00
Birkenhead killed	10. 50	11. 00	10. 75	11. 50	9. 75	11. 50	9. 25	11. 00
Refrigerated hind quarters.....	10. 50	11. 50	11. 75	12. 87½	10. 50	13. 50	9. 12½	10. 62½
Refrigerated fore quarters	8. 00	8. 75	6. 25	7. 75	4. 50	7. 50	5. 25	8. 00
Australian frozen hind quarters.....	.....	.....	.....	.....	6. 50	7. 00	.....	.....
Argentina Deptford killed.....	.....	.....	9. 00	10. 25	8. 00	10. 00	.....	.....
Mutton, Scotch prime.....	14. 62½	15. 37½	14. 37½	15. 62½	14. 12½	16. 62½	12. 12½	14. 60
English prime.....	14. 12½	15. 12½	13. 87½	15. 12½	13. 12½	15. 12½	12. 00	15. 12½
Ewes	11. 25	12. 37½	10. 50	11. 50	9. 50	12. 12½	10. 00	12. 12½
Dutch and German	12. 37½	13. 37½	12. 87½	13. 87½	12. 12½	14. 12½	10. 00	13. 62½
New Zealand, frozen.....	6. 25	7. 75	5. 00	6. 75	6. 00	8. 00	6. 50	8. 00
Australia, frozen.....	5. 50	6. 00	4. 75	5. 50	6. 00	7. 00	5. 75	8. 00
River Plate:								
Frozen.....	5. 50	6. 00	4. 75	5. 50	6. 00	6. 50	5. 25	7. 50
Town killed	11. 00	12. 12½	9. 00	10. 50	9. 50	11. 00	.....	.....
Lamb, English.....	18. 37½	21. 50	17. 62½	20. 62½	15. 12½	19. 62½	14. 00	23. 00
New Zealand, frozen.....	8. 75	11. 25	7. 75	9. 75	7. 50	9. 50	9. 62½	12. 00
Pork, English, small.	10. 50	11. 50	10. 00	11. 00	9. 00	12. 12½	11. 12½	15. 12½
English, large.....	8. 75	10. 50	7. 75	9. 50	6. 00	9. 00	10. 37½	12. 12½
Foreign.....	8. 75	10. 50	7. 75	9. 50	6. 00	9. 00	10. 37½	12. 12½

Imports from Ireland into Great Britain of cattle, sheep, and pigs during the first eight months of 1895.

Cattle	402,707
Decrease (as compared with same period last year)	32,546
Sheep	453,840
Decrease.....	214,000
Pigs.....	333,891

Average prices (wholesale by the carcass) per 100 pounds of beef and mutton in Liverpool, Berlin, and Paris.

City and product.	Quarter ended—			
	Mar. 31, 1895.		June 30, 1895.	
Liverpool:				
Home grown ¹	\$8. 50	\$11. 00	\$8. 00	\$11. 50
States cattle ²	10. 00	10. 50	10. 00	10. 75
Canadian cattle ²	9. 75	10. 50	9. 00	10. 50
Colorado cattle ²	9. 75	10. 50	9. 00	10. 50
South American cattle ²	9. 00	10. 25	7. 50	9. 50
Mutton (home grown) ¹	10. 00	15. 00	11. 00	15. 50
Berlin: ³				
Beef (first quality).....	13. 10	13. 90	12. 58	13. 03
Mutton (first quality).....	10. 35	10. 90	10. 10	10. 70
Paris: ⁴				
Beef (medium quality).....	13. 40		12. 42	
Mutton.....	16. 35		16. 45	

¹ From official report to Board of Agriculture.

² Compiled from prices in Meat Trades Journal.

³ From Deutsche Landwirtschaftliche Presse.

⁴ From Journal de l'Agriculture Pratique.

Average prices per 100 live pounds of domestic cattle in certain English and Scotch markets for the first six months of 1895 and 1894.

[From official sources. It should be noted that these are live weights.]

Location of market.	Inferior or third quality.		Good or second quality.		Prime or first quality.	
	1895.	1894.	1895.	1894.	1895.	1894.
London.....	\$6. 26	\$6. 11	\$7. 60	\$7. 73	\$8. 00	\$8. 38
Liverpool.....			6. 04	6. 12	7. 43	7. 30
Newcastle.....			7. 25	7. 28	7. 62	7. 67
Shrewsbury.....	5. 65	5. 31	6. 95	6. 18	7. 47	7. 16
Aberdeen.....	5. 46	5. 42	6. 95	6. 95	7. 82	7. 85
Dundee.....	5. 95	5. 73	7. 17	6. 95	7. 47	7. 38
Edinburgh.....		5. 40	7. 65	7. 25	7. 59	7. 40
Perth.....	7. 00	6. 56	7. 20	6. 96	7. 69	7. 38

Average value per 100 pounds of dead meats imported into the United Kingdom.

[Compiled at the Board of Agriculture from the trade and navigation accounts.]

Product.	First quarter, 1895.	Second quarter, 1895.	Average for the last nine months of 1894.
Beef:			
Fresh.....	\$8. 79	\$8. 46	\$8. 56
Salted.....	5. 75	5. 57	5. 90
Mutton, fresh.....	7. 67	7. 75	8. 00
Pork:			
Fresh.....	9. 41	10. 46	10. 36
Salted.....	6. 42	5. 47	6. 12
Bacon.....	8. 00	8. 30	9. 30
Hams.....	9. 33	9. 63	10. 71

In 1895 there were about 30,000,000 sheep in Great Britain. The falling off in English flocks during the last few years has been very marked. Prices have been, however, firmly maintained for mutton, notwithstanding the great increase of the importations of live sheep and frozen mutton. The United States shipped more than three times as many sheep to England this year as in 1894. Argentina increased her shipments of mutton to the same markets from 53,000 to 240,000, but Canada remained practically stationary at about 50,000 head. No law compels the slaughtering of these animals at the port of debarkation. Many of them, therefore, are fattened upon English pastures and sent to market as English. This is probably the principal reason why the table herewith submitted shows no quotations for American mutton as such:

Table showing the quantity and value of mutton imported into the United Kingdom during the first eight months of the years 1893, 1894, and 1895.

From—	Quantities ¹ for eight months ended August 31—			Values for eight months ended August 31—		
	1893.	1894.	1895.	1893.	1894.	1895.
Germany	16,301	7,017	5,368	\$198,918.18	\$83,007.88	\$62,276.59
Holland	72,724	67,958	62,830	834,930.80	755,363.51	679,095.74
Australasia.....	865,932	945,449	1,163,953	8,267,108.00	9,032,520.85	10,658,097.31
Argentina	352,156	367,900	469,670	3,201,928.27	3,296,912.62	3,162,928.14
Other countries.....	41,881	58,436	45,509	507,152.55	635,287.50	433,420.22
Total	1,348,994	1,446,760	1,747,330	13,010,037.80	13,803,092.36	14,995,818.00

¹ In hundredweights of 112 pounds.

The Journal of the British Board of Agriculture for the month of September last says:

Taken in conjunction with the large increase in the arrivals of live sheep, it is noteworthy that, roughly computing the number of carcasses represented by the total weight of mutton received and adding this to the sheep imported alive into the United Kingdom, the total receipts of mutton alive and dead indicate an importation equivalent to 3,000,000 head of sheep in the half year ended June 30, 1895.

The above quotation indicates that the British consumption of imported mutton amounts to 6,000,000 head of sheep in a single year; and as there is no international agreement fixing the price of meats in the English market, the relation of the supply of meats to the demand for meats will continue to regulate the values, and those who can produce beef, pork, and mutton and place it in the European markets at the least cost will secure a monopoly of the trade. The struggle for the privilege of purveying food to consumers in all the markets of the civilized world was never before so strenuous, and neither national legislation nor international treaties can permanently retard, repress, increase, or encourage exchanges between the civilized peoples of the globe. That trade which is profitable will continue in spite of legislation, and that which is unprofitable can not be legislated into remunerative conditions.

THE WORLD'S MARKET FOR AMERICAN HORSES.

During the first eight months of the year 1893, 10,177 horses, in the same period of 1894, 15,614 horses, and during the eight months ended August 31, 1895, 22,755 horses from the United States were landed and sold in Great Britain, this last exportation being valued at \$2,947,000.

The average price of American geldings in the English market during the first eight months of the year 1895 was \$155.50. Geldings from Canada during the same period of time averaged \$141 each, while those from Germany during the same months in the English market averaged only \$56 per head. However, as the appraised or entered values of horses at custom-houses, where they are free of duty, is altogether an arbitrary matter, too much weight should not be given to the per capita valuations above, as they can not more than approximately represent the real subsequent selling value of the animals. The low valuation of German geldings indicates that those shipments are of an inferior class of horses which can not compete with American animals. The fact is Germany herself is a very large importer of a fine quality of horses from Russia, and animals of superior merits always find a market in Berlin and the other larger cities of the Empire.

The Department of Agriculture is credibly informed that Germany has taken during the past year almost as many horses from the United States as did Great Britain in 1892, showing that opportunity exists also there for intelligent horse breeders in the United States.

Twenty-seven hundred mares were sent from the United States into the British market during the first eight months of this year, as against 461 for the same period last year and 112 for the year 1893. The average value per head of American mares this year was \$134. It will be observed that this price is much lower than that of geldings. It indicates that no superior mares for breeding purposes were exported from the United States.

In September, 1895, some good carriage horses were received in England from the country. They were of fine appearance, well gaited, thoroughly broken, and free from blemish. The best of them sold at \$230 single, and as low as \$300 for a matched team. The demand for such animals at that time seemed to be quite abreast, and possibly a little in advance, of the supply.

Europeans who have bought and used American horses generally express a very favorable opinion of them. The horses from the United States which have been criticised have been confined to a limited number of heavy-weight draft horses. Up to date some of the great transportation companies in London which are using American horses decline to give positive expression of their opinions regarding their qualities and durability. The London Roadcar Company, however, is using a great number of American animals, for which it has paid from \$100 to \$175 a head, and the managers of that corporation unhesitatingly declare that the imported horses wear as well as the home bred, and that they

acclimatize with facility and celerity. The Andrews-Star Omnibus Company, of London, is also using many American horses, which they purchased through London and Newcastle-on-Tyne dealers. Inquiry shows that there are many other establishments in England utilizing American horses, including the Great Eastern Railway Company, which has paid as high as \$190 to \$220 per head for imported draft horses.

Editor McDonald, of the London Farmer and Stock Breeder, writes:

From what I have been able to learn, it seems to me too early yet to pass any opinion regarding the future of the trade. The warm climate of London gives the American horses every opportunity of doing well. In Scotland acclimatization is much more difficult, and hence it is found that three months' hard work on the causeway reduces them to skin and bone. The custom is largely pursued there (in Scotland) of buying animals from the ship and feeding them into good condition. By this means the farmer is enabled to reap a substantial profit with half the trouble and risk involved in breeding. This system is hardly pursued at all in England. Dealers usually hold large strings, and the horse repositories, through which the bulk of the trade is done, are called upon to meet the demand. The market at present is rather depressed, as is the market for home breeds.

AMERICAN HORSES IN GLASGOW.

The trade in horses from the United States began to assume growing proportions in the city of Glasgow in the year 1891, during which the Dominion Line took into that city 114 horses. But in 1892 it carried in 147 head; in 1893, 137 head; and in 1894, 209 head. Since 1891 the Allan steamers have also carried to Glasgow 7,500 horses, and out of that number about 3,000 arrived in 1894. The total number of horses taken into Scotland from the United States and Canada in four years has not been less than 10,600. During the same period of time the Scotch export trade has fallen from 1,100 to 20 horses, while the American import trade at Glasgow has grown to about 4,000 animals. Most of the American horses there were natives of the Western States, though shipped from Montreal, Portland, Boston, and New York. As a rule, they have been light wagon or carriage horses.

From reputable sources in Glasgow this Department learns that the importation of American horses is now engaging the serious attention of dealers and contractors in that city. The Department is further informed that the larger proportion of horses received there from the United States have given entire satisfaction to their purchasers, and that the only disappointing animals shipped from this country have been a few of the Clydesdale type, which have shown a markedly rheumatic tendency. If horses of a useful size, trained for roadsters and likewise adapted to ordinary wagon work—something after the style of Cleveland bays—are shipped from the United States to Glasgow they will, as a rule, find a ready and profitable market. Heavy horses, likewise, weighing from 1,300 to 1,500 pounds, in matched pairs, may be shipped at current prices to that port with a probable profit, though it might prove unprofitable to send in a large number of such animals at the same time.

It seems now to be generally conceded in Great Britain that it is cheaper to import American horses than to produce horses in that Kingdom. It is also pretty universally admitted that the Canadian carriage horses are inferior to those exported from the United States, though the Canadian animals are claimed to possess, as a rule, greater power of endurance. There are now a number of reputable firms of agricultural salesmen in England and in Scotland, at London and at Glasgow, to whom consignments have been made by Americans, with quite satisfactory results. Immediately upon the arrival of steamers carrying horses, or within a few days after landing, the animals are exposed for sale at auction. They are readily purchased by contractors and others who require them for their own use, and thus there are very few transactions through middlemen.

INSPECTION OF HORSES FOR EXPORT.

In view of the growing foreign market for American horses, the Bureau of Animal Industry, under existing laws, will soon institute a thorough and rigid veterinary inspection of all horses for exportation. This, it is hoped, will preclude the possibility of the growth of the trade being impaired or suppressed by the foreign protective or agrarian element upon alleged sanitary grounds. After inspection each animal will be tagged and described so that identification will be easily made upon landing should any communicable or contagious disease be alleged to affect a horse in any lot shipped from the United States.

It is important that the law providing for meat inspection be amended in several particulars. The suggestions of the Chief of the Bureau of Animal Industry (on page 40 of his report) are worthy of immediate consideration by the legislative branch of the Government. Unless the law can be perfected it can not be satisfactorily administered, nor can needed additional regulations be instituted and carried out.

DAIRY PRODUCTS.

CHEESE.

Throughout the year United States cheese has commanded the minimum figure upon the English market, and as by the operation of an invariable law the lower grades always suffer the most by a material fall in prices, our cheese has suffered disproportionately to other makes by the depressed condition of the English cheese market, and has reached in 1895 the lowest price yet quoted for American cheese in that country, namely, \$2.17 per 100 pounds.

Our agent and correspondent reports in explanation that "United States cheese is, as a whole, the poorest in quality that reaches the English market, and the British public are not only aware of the fact but are prejudiced against it because so much in the past has been adulterated." While accusations that "filled cheese" is being dumped on the British markets from the United States go unrefuted, the very

first statement impugning the Canadian product in the same manner was met with cabled denials from the Canadian Government; denials from the Canadian agent-general in London and Canadian exporters. The incident it seems has actually turned out to be an excellent advertisement for Canadian cheese, and it is now perfectly well understood by the British public that Canada is maintaining with strenuous care the quality of her exports.

During the first eight months of last year Canada and the United States stood side by side in supplying the English market with cheese; but whereas Canada has this year not only held her own but made a slight gain, shipments from the United States have fallen off 117,000 hundredweight, an amount about corresponding to the increased shipments of Australasia and Canada and to the falling off in the total imports into Great Britain. In fact, every country shipping cheese to Great Britain has this year enlarged its trade with that country except the United States, which has lost over 21 per cent of its last year's business.

BUTTER.

Shipments of butter from the United States represent almost 1 per cent of the total imported into Great Britain. Denmark still holds the lead of all competitors in supplying this great butter market, others being France, Australasia, Sweden, and Finland, in the order named.

The following tables represent the quantity and value of cheese and butter imported into the United Kingdom:

Table showing the quantity and value of cheese imported into the United Kingdom during the first eight months of the years 1893, 1894, and 1895.

From—	Quantity (cwts. of 112 pounds).			Value.		
	1893.	1894.	1895.	1893.	1894.	1895.
Holland	174, 009	185, 904	200, 581	\$2, 128, 135. 05	\$2, 302, 681. 81	\$2, 479, 423. 35
France	38, 355	33, 812	37, 532	579, 877. 53	504, 003. 93	566, 781. 78
Australasia	36, 180	50, 256	92, 160	456, 613. 95	622, 522. 68	1, 063, 155. 04
Canada	480, 642	531, 188	533, 612	5, 844, 160. 42	6, 037, 735. 15	5, 289, 647. 03
United States	522, 461	538, 741	421, 946	6, 277, 775. 25	6, 280, 412. 91	4, 560, 221. 94
Other countries	12, 638	3, 269	14, 074	155, 976. 18	403, 194. 88	171, 252. 13
Total	1, 264, 285	1, 372, 670	1, 299, 905	15, 442, 538. 38	16, 150, 550. 86	14, 130, 481. 27

Table showing the quantity and value of butter imported into the United Kingdom during the first eight months of the years 1893, 1894, and 1895.

From—	Quantity (cwts. of 112 pounds).			Value.		
	1893.	1894.	1895.	1893.	1894.	1895.
Sweden	185, 099	176, 158	203, 785	\$4, 873, 347. 16	\$4, 560, 309. 55	\$5, 231, 623. 75
Denmark	649, 779	762, 774	791, 037	17, 365, 136. 81	19, 599, 215. 57	18, 949, 396. 69
Germany	132, 149	111, 257	92, 537	3, 192, 920. 38	2, 763, 208. 43	2, 246, 434. 79
Holland	94, 838	104, 556	128, 687	2, 381, 786. 76	2, 511, 313. 52	3, 009, 331. 67
France	319, 575	267, 442	296, 940	8, 791, 259. 24	7, 253, 620. 44	7, 692, 919. 39
Australasia	101, 095	203, 760	245, 940	2, 529, 567. 76	4, 865, 020. 57	5, 306, 567. 85
Canada	13, 232	2, 908	8, 353	277, 989. 07	56, 568. 18	155, 737. 73
United States	19, 793	26, 936	19, 371	436, 291. 45	552, 235. 82	365, 970. 53
Other countries	77, 216	99, 281	129, 318	1, 917, 376. 66	2, 384, 249. 19	3, 085, 589. 72
Total	1, 592, 776	1, 755, 072	1, 915, 968	41, 765, 675. 29	44, 545, 741. 27	46, 043, 572. 12

No one can carefully peruse the above facts and figures without arriving at the conclusion that unless our shippers of cheese pursue a very different course the history of our foreign trade in that product will speedily fall, in the face of active, intelligent, and honest competition from all parts of the world, to the level now occupied by American butter. We have here a graphic illustration of the disastrous effects in all trade of disregarding the tastes of consumers and of acquiring a bad reputation.

SUBSIDIARY FARM PRODUCTS.

The importance of the subject to American farmers, who must learn to make up from subsidiary products, and, if necessary, in small sums, the losses entailed by low prices for staple crops, suggests reference to two so-called minor crops, one of which, eggs, is not quite sufficient to supply our own consumers, and the other, honey, affords us a little surplus for which there is a foreign demand, which, by intelligent and assiduous cultivation, could doubtless be greatly developed.

The importance of the following table to poultry keepers is seen in the evidence it presents of a large foreign market of which we not only get no share, but in which we actually figure as purchasers ourselves:

Table showing the quantity and value of eggs imported into the United Kingdom during the first eight months of the years 1893, 1894, and 1895.

From—	Quantity (great hundreds).			Value.		
	1893.	1894.	1895.	1893.	1894.	1895.
Russia.....	825, 037	744, 425	1, 243, 262	\$1, 055, 908. 83	\$910, 395. 62	\$1, 525, 603. 81
Denmark.....	630, 191	754, 762	712, 662	1, 007, 818. 08	1, 200, 993. 80	1, 136, 199. 02
Germany.....	1, 199, 894	2, 256, 924	2, 331, 922	1, 704, 085. 50	3, 103, 629. 83	3, 055, 242. 22
Belgium.....	1, 167, 599	2, 109, 085	1, 523, 905	1, 984, 247. 23	3, 045, 246. 43	2, 260, 231. 32
France.....	3, 046, 727	1, 804, 327	2, 039, 535	6, 283, 576. 13	3, 540, 198. 68	3, 859, 153. 95
Canada.....	23, 065	28, 277	79, 463	33, 802. 70	57, 218. 99	144, 904. 89
Other countries.....	138, 413	120, 521	171, 613	247, 719. 45	189, 146. 25	299, 576. 87
Total.....	7, 030, 926	7, 818, 321	8, 107, 362	12, 317, 157. 92	12, 026, 829. 60	12, 280, 917. 09

HONEY.

The English honey market is supplied by the home product, from the United States, and from Chile. There is a large and steady demand, and, though sometimes exceeded by the supply, this is an unusual occurrence. The English honey harvest has been very good this year, and it is selling upon the retailer's counter at from 20 cents to 25 cents per pound. Wholesale prices at the latest date obtainable are as follows:

English: Earthenware pots, finest, per doz.....	\$1. 45
Earthenware pots, finest, $\frac{1}{2}$ -pound, per doz.....	90
Flint glass jars, 17-ounce, per doz.....	1. 70
Transparent honey, in glass jars, nickel-plated, screw top, per doz.....	1. 57
United States: Thurber-Whyland's white sage, strained, 1-pound jars, 2 dozen in a case, per doz.....	2. 30
Californian, in original cans, about 56 pounds per cwt. of 112 pounds.	9. 60
Chilean, in original cwt. kegs, per cwt.....	8. 75

The American white sage commands the top price. It is a delicious honey and most attractively put up. All honeys sent to England are strained except a nominal quantity that reaches there in the comb from California. California shipments of strained honey are made in 56-pound tins, two tins in a case. Chilean usually comes in 66-pound kegs, but sometimes in 112-pound barrels. It is not a matter of great importance, as to size of packages, etc., though it would be well to conform to the California practice. It would be ruinous to send adulterated honey to England.

Our agent in England has had several inquiries as to honey market this year, especially from Texas, and he has supplied inquirers with names of importers in England, and with information as to how to approach them, and this he will be pleased to do for all inquirers.

The Department has knowledge that some years ago a large honey maker in California found in China a profitable market for some 20 tons of honey annually.

In this, as in every other branch of industry, only the makes of the best, most genuine products can secure a permanent, profitable trade, creditable alike to themselves and their country, and they alone deserve to.

WEATHER BUREAU.

For the fiscal year ended June 30, 1895, Congress appropriated \$878,438.84 to maintain the United States Weather Bureau. Expenses, however, were reduced while the efficiency of the service increased, so that there remains approximately a sum of \$55,000, which will ultimately be covered back into the Treasury of the United States out of the appropriated amount. During the same twelve months the Weather Bureau received for condemned property, sale of publications, and seacoast telegraph lines, and deposited in the Treasury of the United States, the additional sum of \$5,498.57, making a total to be covered in by this Bureau of something over \$60,000.

FORECASTS.

Detailed statements as to forecasts published during the year in the different States and Territories of the Republic are contained in the annual report of the Chief of the Weather Bureau. That report also gives approximations of the value of property saved because of those forecasts, and declares that the warnings of cold waves alone secured from freezing more than \$2,275,000 worth of perishable agricultural products which otherwise would have been lost. It is proved by the report of the Chief of the Weather Bureau that the degree of accuracy in the forecast division thereof is steadily augmenting. It is now a duty, under orders from the Secretary of Agriculture to the Chief of the Weather Bureau, that reports be made on the first day of each month of all forecasts made for the previous thirty days, together with the percentages of their verification.

Thus every forecaster realizes that his work is to be reviewed at the close of each four weeks and his accuracy tested by mathematical computation and verification. This feature in the administration of the Weather Bureau has been adopted since Prof. Willis L. Moore was appointed Chief of the Weather Bureau and entered upon his duties July 4, 1895. Since that date many reforms have been successfully instituted, and thus far the service continues to show a marked and decided improvement as to its management and efficiency.

The present Chief of the Weather Bureau began his profession in an observer's station twenty years ago. He came up from the ranks of the intelligent and industrious workers. In 1894, at a competitive examination, which had been instituted by the Secretary of Agriculture, for a \$2,500 professorship, the present Chief of the Weather Bureau was decided, after a severe contest and examination by Professors Harrington and Mendenhall and Maj. H. H. C. Dunwoody, of the Signal Corps of the Regular Army of the United States, to be entitled, by ability and acquirements, to the place. Thereupon, he was detailed to take charge of the Weather Bureau station at Chicago. He gave an entirely satisfactory and markedly useful service in that city. From there he was called to his present position. His success and promotion opens the way for advancement, through industry, skill, and attainments, to every observer in the Bureau.

The possibilities of usefulness to agriculture, manufacture, and commerce are almost without limit in the increasing accuracy and capabilities of the Weather Bureau. The time is not probably very distant when its records, warnings, and forecasts will be constantly in demand as evidence in the courts of justice and also by those purposing large investments in certain kinds of agricultural crops, in perishable fruits, in commercial ventures, and in manufacturing plants. Weather Bureau forecasts in the not distant future will, no doubt, be consulted and awarded credibility just as thermometers, barometers, and aerometers are to-day. The usefulness of the meteorological branch of the service, wisely and economically administered, is beyond computation. The annual report of the present chief is replete with interesting and practical suggestions.

DIVISION OF STATISTICS.

The work of the Division of Statistics, in charge of Henry A. Robinson, its chief, is primarily collecting, through many thousands of unpaid county correspondents in the several States and Territories of the Union, agricultural data as to area, condition, and probabilities of crops. After this data has been tabulated, averaged, and consolidated it is given to the general public in the form of approximations as to acreage, condition, and yield.

From its origin, the conclusions and reports of this Division have been frequently subjected to more or less severe criticism. Public

attention is often called to the fact that the annual cost of securing agricultural statistics which are published from time to time by this Department is about \$100,000, and that therefore they ought to more nearly attain accuracy. The authors of these criticisms forget that while about that sum of money is exhausted annually in the payment of certain State statistical agents and the employees and expenses of the Division in the city of Washington, 10,000 county crop reporters in 2,500 counties throughout the several States and Territories of the American Union perform their duties without any pecuniary remuneration whatever.

Added to the foregoing unremunerated force there are 15,000 millers and elevator men who send in figures and data from month to month relative to cereal and other crops, and also 15,000 township correspondents who do the same thing, and 6,300 agents who report to the several State statistical agents, who condense and send to this Department the results of their inquiries and estimates, and added to this last list are 3,000 special cotton-crop correspondents; and supplementing all the foregoing there are 123,000 American farmers who have been selected because of their large experience and superior intelligence who assist (by making special investigations) in verifying the vast amount of data and figures furnished by the tens of thousands of correspondents enumerated. And not a single one of the aforesaid correspondents among the farmers, elevator men, millers, and other intelligent classes of citizens named receives a dollar of salary out of the Treasury of the United States. The marvel, therefore, is that the data thus patriotically and freely furnished the Division of Statistics should prove as valuable, reliable, and accurate as it does.

The statistical system of this Department at present, consequently, provides for the payment of collating and disseminating data evolved from facts and figures which have been furnished to its various sections and officers in Washington as mere gratuities. The fact that some citizens are paid fair salaries for industriously and correctly making computations, averages, and approximations, and determining results from conditions and figures which have been gratuitously collected and sent in by other citizens who were wholly without compensation, is not calculated to inspire great faith or credibility as to the reliability of the conclusions reached. During the past year, however, in addition to the usual county and township crop correspondents, generally belonging to the agricultural classes, the Department has secured from month to month data from millers throughout the country, from railroad managers, from railroad station agents, and from bankers, merchants, and nearly every other intelligent source of information. During the last twelve months a visible improvement as to the accuracy of figures promulgated has been developed relative to the cotton and some other crops, and yet the condition of the Division and the fruits of its labors are not entirely satisfactory.

Neither individuals nor governments can ordinarily, successfully, and permanently obtain a valuable gratuitous service. Humanity seldom gives, either to citizens or governments, something for nothing, except in cases of poverty and distress. It is therefore the opinion of the Secretary of Agriculture that no satisfactorily accurate statistical work can be accomplished for agriculture and commerce by this Department until a sufficient permanent appropriation shall have been made to provide for the taking of an annual agricultural census. Others, who have made this subject a profound study and whose judgment is entitled to great consideration and respect, believe that reliable detailed data may be gathered by the assessors of taxes in the various States and Territories. Others again, of equal experience in statistical research, declare that the collectors of internal revenue and their deputies and other employees could be successfully commanded by the Treasury Department for the collection of agricultural statistics.

Again, men of great experience in the cereal and cotton trades claim that if the acreage be accurately ascertained as to each staple product, and that acreage published in the month of June each year, and additionally the climatic conditions in each locality be also officially promulgated each day or week or month during the growing season, more accurate approximations of crops can be reached than by any other method.

It is possible, in the opinion of the Secretary, that the duty of ascertaining and reporting to this Department accurately the acreage of staple crops in each State on June 1 of each year might be, without working any hardship, imposed by law upon the authorities of our agricultural colleges and experiment stations in consideration of their united annual appropriation of \$40,000 each. The acreage being given, the character of soil known, and climatic conditions published daily by the Weather Bureau, approximations of the yields of each crop could be probably computed with more accuracy than under the present methods.

Attention is particularly directed to the report of the Chief of this Division, which in detail and very clearly describes its work during the fiscal year, and likewise reiterates cogently an argument in favor of taking an annual agricultural census. It concludes that if there be value in statistics as now gathered and published there would be infinitely greater value and use for statistics based upon absolutely accurate returns made by the takers of a yearly farm census.

If, however, the Congress of the United States finally provides for a permanent Census Bureau to gather populational, agricultural, commercial, and manufacturing statistics each year, instead of once in ten years, the entire business of collecting agricultural data and statistics should be vested in that Bureau, which is now proposed and advocated as a permanency by many of the most thoughtful economists and statisticians of the United States.

EXPERIMENT STATIONS.

The Office of Experiment Stations continues in charge of Dr. A. C. True as Director.

In his report for 1893 the Secretary of Agriculture recommended that he be given authority to supervise the expenditures of the agricultural stations; this had not been done before. In pursuance of this suggestion the Fifty-third Congress inserted the following sentence in the paragraphs providing the usual appropriation for these stations:

The Secretary of Agriculture shall prescribe the form of annual financial statement required by section three of the act of March second, eighteen hundred and eighty-seven; shall ascertain whether the expenditures under the appropriation hereby made are in accordance with the provisions of the said act, and shall make report thereon to Congress.

The blank schedules for reports and instructions for filling them up were prepared and distributed to the experiment stations as soon as practicable after the passage of this act. The new law applied to the appropriations made for the fiscal year ended June 30, 1895. Under the original experiment station act the reports of these stations are not due until February 1, 1896. A complete report on their work and expenditures during the past fiscal year is therefore not possible at this time. This will, however, be prepared as soon as practicable for transmission to Congress. It is respectfully recommended that the original experiment station act be amended so as to require the financial reports of the stations to be rendered to the Secretary of Agriculture on or before September 1 following the close of the fiscal year. Thus it will be possible thereafter to include a report on their expenditures as a part of the Annual Report of the Secretary of Agriculture.

In order that the Department might have accurate and complete information regarding the work and expenditures of the stations as the basis for the report to be made by the Secretary of Agriculture, it was decided that the stations should be visited by representatives of the Department. Up to the end of the fiscal year 35 of these stations were thus visited. In connection with these visits inquiries were made regarding the general management of the stations and their relations to the colleges; their methods of keeping accounts and records of their work; the lines and methods of work undertaken; and all other matters which might throw light upon the expenditures as reported.

WORK OF THE STATIONS.

In regard to the work of the stations the Assistant Secretary of Agriculture, Dr. Charles W. Dabney, jr., says:

In a general way it may be said that the investigation of the work of the stations thus far made clearly indicates that even the poorest of our stations have done scientific work of practical benefit to the farmers of their communities, and that in many

cases the services of the stations already rendered have been of great value to practical agriculture, far surpassing in the aggregate the total amount of expenditure made for them by the National Government. The greatest hindrances to successful work have arisen in those communities which have failed to appreciate the fact that the stations are primarily scientific institutions, and that while they should always keep steadily in view the practical results to be obtained, they render the most permanent benefits to agriculture when they make thorough scientific investigations of problems underlying successful agriculture and horticulture.

The importance of adopting definite lines of work and sticking to them until definite results have been obtained is strongly urged. In order to accomplish this there should be greater permanency in the organization and tenure of office of the stations, as frequent changes in boards of management and station officers have caused corresponding changes in the policy and work of many of the stations, which have either prevented their carrying out any thorough inquiries or discouraged the undertaking of important investigations.

In some cases the institutions with which the stations are connected have not received that support from the States which was necessary and was evidently contemplated under the acts of March 2, 1887, and August 30, 1890. In all of the acts from the land-grant act of 1862, providing the first endowment for colleges of agriculture and mechanic arts, down to the act of August 30, 1890, making a handsome addition to the income of the same institutions, it is clearly implied that the States shall provide the necessary land and buildings for these colleges as well as the experiment stations connected with them. The United States has provided a part of the funds necessary for paying the current expenses of these institutions, but in doing so it places the obligation upon the States to provide the necessary land, buildings, and other things belonging to the plant. In all such cases this Department has sought to bring the local communities to realize more fully the importance of contributing from their own means to build up strong institutions for the benefits of agriculture.

THE NUTRITIVE VALUE AND ECONOMY OF FOODS.

The supervision of the investigations on this subject was assigned to the Office of Experiment Stations, with Prof. W. O. Atwater as special agent in charge. In accordance with the terms of the law, the cooperation of the agricultural experiment stations has been sought as far as was justified by their facilities and the requirements of their work. As a rule only such institutions were invited to join in this work as were in a position to contribute the services of experts, laboratory facilities, and other resources to supplement those provided by this appropriation. In this way work has been carried on under the immediate direction of Professor Atwater at Middletown, Conn.; in connection with the Society for Improving the Condition of the Poor and the Industrial Christian Alliance in New York City; in connection with the New Jersey State Experiment Station at New Brunswick; at Pittsburg, Pa.; at Charleston, S. C.; at Suffield, Conn.; in connection with the agricultural experiment station at Auburn, Ala., and the Tuskegee Normal Institute, in Alabama; in connection with the University of Missouri, at Columbia; the University of Tennessee, at Knoxville; Purdue University, at Lafayette, Ind.; the Hull House, at Chicago, Ill., and the Maine State College, at Orono, Me.

The work has included so far the following lines: Studies of the composition, nutritive value, and cost of food materials; studies of actual dietaries, with a view to learning what are the kinds and amounts of food materials actually consumed by people of different sections, of different occupations, and under different conditions; studies on the digestibility of food; methods of investigation of food subjects, etc. The results of inquiries on food conducted in this country and abroad have been compiled, and already one technical and several popular publications have been prepared and published.

A standard table of the results of food analyses is in course of preparation. Many food materials never before analyzed have been analyzed by our agents, and during the year the number of food analyses tabulated has increased from about 1,100 to 3,000. When completed, this standard table of analyses will form an important advance in the study and will furnish a basis for future investigation.

An effort will be made to build up centers of inquiry where the more scientific and fundamental problems can be investigated, where workers in this line can be trained, where the importance and usefulness of accurate information regarding the rational nutrition of man will be taught to large bodies of students, and from which the practical results of food investigations may be widely and efficiently disseminated among all the people. The results of this work thus far published have awakened great interest in the subject, especially among physicians, teachers, clergymen, the officers of our Army and Navy, the superintendents of benevolent institutions, and persons studying the sociological conditions of modern times. The investigations already made plainly show the wastefulness of the dietaries of a large number of people, and the importance of practical instruction in regard to proper methods of preparing and cooking food.

The work of the experiment stations is so varied and voluminous that no adequate conception thereof can be obtained except by a careful perusal of the report of the Director of the Office of Experiment Stations, to which you are respectfully referred.

FORESTRY.

The timber investigations have been continued and have received most of the attention and the largest share of the appropriation for this division, of which Prof. B. E. Fernow is chief. They are the most comprehensive experiments of the kind ever undertaken, and include tests of the average values of strength for the various species, variation of strength in the various parts of the trees, the variation of strength of timbers containing different amounts of moisture, the effects of dry kiln treatment, etc. Altogether 175 trees, representing 24 species and 5 different sites, have been collected during the year. The total collection to date for this purpose numbers 761 trees, representing 39 species,

mainly of Southern timber. Thirteen thousand tests were made during the year, 340 of which were large columns and beams, and a large amount of material was placed in dry kilns for next year's work.

Results referring to the four Southern pines, representing 163 trees and over 24,000 separate values, have been computed and arranged for publication. These results show that the short-leaf and loblolly pine are inferior to long-leaf and Cuban pine by about 24 per cent; that the wood near the stump is 25 to 30 per cent heavier and better than that of the upper log; that the wood produced by trees 25 to 60 years of age is the best, and that in old trees there is a variation of 15 to 25 per cent in wood and quality. Special experiments in shrinking and swelling of timber were continued and it was found that the wood of all pines varies in proportion to its original weight. Treatment with high temperature under pressure does not, as has been claimed by owners of certain processes of wood treatment, do away with shrinkage either in pine or oak. These specimen results show the great practical value of these timber investigations.

A series of experiments have also been begun with the object of determining how far the great deterioration of resin, so often noticed by turpentine collectors, is due to unavoidable physiological causes, how far to existing practices, and how these practices may be improved.

A series of measurements of the rate of growth of white pine has been made in Wisconsin and Michigan, comprising detail measurements of over 400 trees and the determination of 13 acre-yields, including measurements made in connection with the collection of material for timber investigations. There are now on hand measurements of 1,700 trees, mostly pines, spruce, and a few hard woods, in addition to 57 acre-yields. Over 500 of these measurements have been worked up and tabulated, and the results charted so as to show the growth and development. These results show, for example, that the longleaf and Cuban pines both grow in height and thickness much faster than had been supposed. Trees of white pine over 200 years old have been found to have made over $1\frac{1}{2}$ cubic feet annually for a century and a half. This work will be made the basis of a discussion of profitable forestry, and should be continued until the rate of growth and capacity for production of all of our important species is established.

A series of experimental plantings in the Western treeless country for the purpose of testing the best varieties of trees suitable for forest planting and the best methods of planting in the conditions prevailing there have been started in connection with the agricultural experiment stations in South Dakota, Nebraska, Kansas, and Colorado. It is proposed to continue these experiments for a number of years in the hope of getting material for a report on Western forest planting.

This division has continued most actively its propaganda work. Through publications and by correspondence, and through lectures and addresses before agricultural colleges, summer schools, and public

meetings it has sought in every way possible to further the establishment of a forestry policy among the people of the United States. By the extension of Arbor Day it is endeavoring to educate the children in the schools and the young people in the academies and colleges to love trees and to plant them.

ARBOR DAY IN JAPAN.

In this connection it is interesting to note that through the agency of Dr. Northrup, of the United States, and of the vice-minister of education of Japan, Mr. S. Makino, Arbor Day has been taken up by the teachers of that progressive country with the prospect of its early establishment as a memorial day in all of its public schools. Through the courtesy of the Hon. S. Kurino, Imperial Japanese minister to the United States, the Secretary of Agriculture is able to present to you the following translation from a Japanese document, setting forth the movement and a carefully considered plan for Arbor Day, drawn up for the bureau of private revenue in the Imperial household department. This plan shows such an intelligent appreciation of the reasons for Arbor Day, and contains so many valuable suggestions with regard to the method of carrying it out, that it seems to merit special attention:

Some time ago Dr. Northrup, of the United States of America, came to Japan and had a talk with Mr. Makino, vice-minister of education, on the subject of Arbor Day. About the same time the meetings of the presidents of normal schools were being held from time to time at the educational department, and the vice-minister took this occasion to explain at one of the meetings the purport of his interview with Dr. Northrup, recommending the advisability of the adoption of this system in Japan. Ever since then the question of Arbor Day has attracted the attention of educators in Japan. The following article is contributed to this office, embodying some remarks on the subject by one now living in Shizuoka, who has been in the service of the bureau of private revenue in the Imperial household department and who has had many years' experience in the forestry business:

"There are two objects to be attained by the adoption of a definite day for tree-planting by the boys of our school—an Arbor Day—(1) To foster the idea of industry in the minds of school boys, divert them from indulging in bad practices, and cultivate among them botanical taste, besides affording intellectual pleasure and teaching them to look upon trees as the embodiment of love of home and country.

"(2) In addition, the practice might be made conducive to increasing the resources of the country.

"This system, if widely adopted, will be of indirect, but great benefit, by inspiring dwellers in the country with the love of forests, thereby on the one hand reducing the danger of injury to them and on the other promoting their growth. Other benefits to accrue, such as the prevention of sand falling, the protection from wind, the preservation of water resources, the addition to natural beauty and to the landmarks, the increase in the supply of fuel, are of vast importance to the country and the people.

"To simultaneously attain the two objects indicated above special heed must be given to the following points:

"(1) *Plantation fund.*—There ought to be a fixed and permanent source of income. This needs no argument. Nothing, however meritorious, can be undertaken without such a fund, and nothing can be maintained unless the fund is stable. Especially

is this the case with forestry, as the foundation principle of forestry economy is permanency, and the Memorial Day plantation ought to thrive with the age of the school.

“(2) *Selection of ground.*—This is the first step to be taken after the source of the fund is determined; but there will be great difficulty in getting proper ground, as it is at present even difficult to get proper space for school premises. It may, however, be comparatively easy to find a space of ground if we confine our object to those mentioned under A in a preceding paragraph, as we need not then look beyond the school ground, playground, garden, public garden, or roadside. If, on the contrary, we want to attain at the same time economic advantages, a choice must be determined by the following considerations:

“(a) *Area.*—A reasonable area is necessary, otherwise the space will be filled up very soon, which will make it impossible to continue the practice permanently or to utilize the land economically.

“(b) *Distance.*—The ground must be selected as near as possible to the school, otherwise it will be difficult to induce school boys to go there on Memorial Day. It will also entail expense. Moreover, it would be difficult to let the boys visit the grove frequently for future research into the theory of tree growth and to enjoy the observation of the several stages in the growth of the plant.

“(c) *Location and surface of the ground.*—Shrubby or grassy, steep, or rocky land is objectionable on various grounds. But level ground being generally better utilized for farming, care must be taken not to employ it for this purpose, except in cases of sandy or poor ground fit only for forestry.

“(d) *Nature of soil.*—Every seed, properly selected, will grow even in poor earth unless it be rocky. But rich soil should be selected, because, in poor soil growth being slow, schoolboys will fail to find pleasure in the natural development of the grove and will at last become indifferent.

“Above all, it is of the utmost importance to bear in mind that this matter should be so effected as to secure to the boys more pleasure than pain, and this with the greatest possible economical benefit.

“(3) *Selection of trees.*—The trees planted must be those best adapted to the soil which will produce the greatest possible benefit. To attain the two objects mentioned under A and B, the tree which will bear beautiful and fragrant flowers, or which will produce fine fruit, should be adopted. I should recommend pine, cedar, oak, camphor, etc. If a poor selection is made, the tree may not grow—may perhaps die—the boys will be disappointed, the teachers disheartened, and the expenses totally lost.

“(4) *Arbor Day or Memorial Day.*—It is desirable to select for Arbor Day some day especially memorable; but this is very difficult, as planting can not be done in every season, and trees planted out of the proper season generally die. The best way would therefore be to determine the date according to the respective localities and the kind of trees to be planted. The 11th of February (the day when our first Emperor ascended the throne), the 3d of April (the day when the same Emperor died), in the spring, and the 3d of November (the birthday of the present Emperor), in the autumn, may be good. But the spring season is recommended as most suitable for planting.

“(5) *Protection of young trees.*—The choice of trees to be planted being made, the means of obtaining the shoots must be determined. The best way would be to let the boys sow the seed and take care of the plants by spading the ground, cutting the grass, manuring, etc., as may be required, until the plants have grown sufficiently to be safely transplanted. This will enable them to become familiar with the different kinds of seeds and the different stages of their growth, and will promote fondness for the plants. This method is also applicable to small spaces which do not admit of the growth of plantations, and will enable us to obtain the desired plants at the proper time and in desirable places, while giving an immense advantage on the other hand in attaining the object mentioned under A. If, under certain circum-

stances, it is impossible to let the boys care for the plants, we must depend upon reliable and experienced dealers.

“(6) *The mode of planting.*—This must vary according to the kind of plants, the location and nature of the ground, and special care must be exercised in the transportation of the plants, cutting of the grass and prickly shrubs, and the tilling of the ground. Much depends upon the circumstances in each case, whether the boys have to do all the work, or whether they are to have assistance from coolies. If the boys do it all, those who supervise their work must fully consider details as to implements, and apportionment of space to planting, to the various classes of children, whether any and what distinction shall be made between male and female, between elder and younger, between higher and lower classes; whether shoots and modes of planting shall vary according to such distinctions. The growth of plants and the benefits resulting therefrom will differ greatly according as the manner of conducting the work is based upon the principles of forestry or not.

“(7) *Care and protection after planting.*—It is better not to plant the shoots than to leave them without protection. To plant them is easy, but it is difficult to make them grow into large trees. All requisite precautions, such as cutting spreading grass, protection against insects and worms, provision against fire, supplanting for decay, should be undertaken by the boys. But how boys are to undertake those precautionary measures, how they are to protect the tree for long years until it become fit to be cut as fuel, these are questions calling for special inquiry.

“There are many other points to be investigated, such as superintendence, control, keeping of records, utilization of principal and secondary products, etc.

“It would be improvident if, believing in the system of Arbor Day and approving it as feasible, one should try to at once apply it in practice without full consideration of means and methods. It is not easy, as stated above, to start the plan, and it is very difficult to carry it out successfully. The plan, if undertaken without proper care and full consideration of means and methods, would result in needless trouble and expense, and we should be not only unable to obtain good results but every tree and every plant would die, and both boys and teachers would be disheartened in spite of great encouragement from the other side.”

CHEMISTRY.

This division, of which Dr. H. W. Wiley is chief, has received 1,420 samples for analysis during the fiscal year. It has completed 613 of these analyses, and the unfinished samples, consisting almost entirely of specimens received from divisions of the Department, can be worked up when time is found.

The investigation of food adulterations has been continued, being confined chiefly to the examination of cereal products and the manufactured articles therefrom. No adulterations of cereal products with gypsum, terra alba, and the like, have been found in this country, as they have frequently been found in Europe.

Active preparations have been made for carrying out “Investigations relative to the various typical soils of the United States to determine their chemical characteristics, especially the nature of the nitrifying organisms contained therein,” provided for in recent appropriation acts. The methods employed in the chemical and bacteriological examinations of soils have been systematized and studied. A vegetation house capable of holding about 200 pots for cultural purposes has been constructed and fully occupied. Through the

cooperation of the experiment stations samples of typical soils have been secured, and the chemical analyses, pot cultures, and bacteriological examinations are well under way.

PERVERSION OF OFFICIAL ANALYSES.

The people are frequently misled by perverted references to the analyses of this division by advertisers of baking powders, food products, etc., whose products have been analyzed in the course of investigations of food adulterations or other official work. There can be no objection to advertisers referring to the published reports of the Department in support of the virtues of the wares they offer for sale, but exaggeration, perversion, suppression, and misstatement of facts, attributed to official authority, should not be allowed. In the hundreds of advertisements that have been noticed in which the work of this division has been referred to, there is scarcely a single case in which the facts were accurately set forth as officially published. There is, therefore, just reason for complaint. It seems to the Secretary of Agriculture that there should be some method adopted by means of which advertising misrepresentations of official analyses, intended originally to protect the people, could be prevented.

BOTANY.

The herbarium of the Department of Agriculture, commonly called the National Herbarium, having outgrown its old quarters, was, by the kind permission of the Secretary of the Smithsonian Institution, removed and well installed in the fireproof building of the National Museum, where it will be cared for by the botanists of this Department. This herbarium is steadily being built up and enlarged at the expense of the Department of Agriculture.

This division, with Mr. Frederick V. Coville as chief, has continued its investigation upon weeds, pure seed, poisonous plants, and other subjects mentioned in the last report. Several bulletins have been published calling attention to dangerous weeds, and a general bulletin on "Weeds; and How to Kill Them" was issued in the series known as Farmers' Bulletins. In addition to illustrations and special remarks regarding many of the weeds, it gives a tabular arrangement of the most important facts, from a practical standpoint, concerning about 100 of our common weeds, with brief instructions as to the best method of their eradication. A bulletin has also been prepared on the subject of weed legislation, consisting of the laws now in force in the different States, and suggestions for similar legislation by other States.

SEED TESTS.

The seed-testing laboratory of this division is doing much to educate American farmers, seed producers, and dealers in seeds with regard to the best methods of harvesting, cleaning, and preparing for market the

various commercial seeds, as well as the simpler means for testing their purity and germinating power. The special investigation of clover seed grown in this country has been continued. The methods of handling and growing seed have been carefully studied, and a report on this subject will be published at an early date, which it is hoped will materially assist the producers of this seed, the demand for which is steadily growing abroad. Seeds purchased by the Department of Agriculture for distribution during the fiscal year 1895 were all submitted to purity and germination tests, but as the number of these seeds was very great few of them could be finished before the seeds had to be sent out. Many of the varieties showed a surprisingly low percentage of germination, and evidences of fraud were detected.

The work upon grasses and forage plants has been separated from the Division of Botany and has been placed in charge of a new division called the Division of Agrostology, which will be spoken of in another place.

The work on poisonous plants has been continued by a careful study of laurel poisoning and the Western leatherwood, and a number of medicinal plants have been taken up for investigation.

AGROSTOLOGY.

In accordance with the recommendations of the Secretary of Agriculture in his report for 1894, the act making appropriations for the Department for the fiscal year ending June 30, 1896, contained a special provision for the Division of Agrostology. This division was organized July 1, when the act providing for its establishment went into effect, with Prof. F. Lamson-Scribner as its chief. The work of this division is devoted to the investigation of grasses and forage plants and experiments in the culture of our native species, as well as those of other countries which may be profitably introduced into the United States. These plants will be studied both scientifically and economically. The nature and the distribution of the various kinds will be considered, as well as their economic value and adaptability to special uses or to various soils and climates. The chief aim of the division will be to instruct and familiarize the people with the habits and uses of all forage plants by the publication of circulars, bulletins, and reports. The importance of this work is attested by the vast interests of our country which are dependent upon the products of our meadows and pastures.

EXPERIMENTAL GRASS STATIONS.

Two experimental grass stations have already been established for the purpose of enabling this division to effectively prosecute special lines of work in the cultivation of the several kinds and to bring under direct and intelligent observation the numerous native and cultivated grasses and forage plants. These gardens afford opportunity for the

proper investigation of the nature and peculiar habits of growth of these plants and to determine in a large degree their actual or probable value to agriculture. About 400 different varieties have been grown upon these gardens during the present season, and some of the native sorts tried have proved of interest. The true buffalo grass of the Western plains is one of these. Its cultivation in the grass garden has been a marked success, the grass forming in a comparatively short period a dense and pleasing sod completely covering the plat assigned to it. As this grass is more hardy than the somewhat similar Bermuda grass of the South, it may possess no less value for the Middle and Western States than is claimed for the latter in more southern latitudes.

When domesticated it may prove of great value because of its ability to withstand drought and its superior nutrient qualities. It is intended that a larger area of ground shall be set aside for the enlargement and continuation of experiments in grass and forage-plant culture, the results of which may prove of incalculable benefit to the farmers and stock growers of the United States.

SPECIAL STUDIES—PUBLICATIONS.

Special studies have been made of the grasses and forage plants of the Rocky Mountain regions and of the prairie regions of Iowa, Kansas, Nebraska, and the Dakotas, with a view to preparing a report upon the actual and prospective forage conditions of these sections of our country. A preliminary report has been published, giving the results of the examination of the grasses and forage plants of the Southeastern States, and circulars have been issued upon Hungarian brome grass, flat pea, saccharine, experimental grass gardens, and a Farmers' Bulletin on alfalfa, or lucern; other papers of a similar nature are in course of preparation, also an illustrated handbook of all the grasses of the United States.

HAY AND FODDER PLANTS—MONEY VALUE.

Each year develops more intelligent interest and inquiry in the production of better hay and fodder plants. The money value of the hay crop for 1894 was estimated at nearly a half billion of dollars. With more intelligent selection of hay plants cultivated the average production might have been 2 tons per acre, instead of 1.14 tons. That would have added 41,396,483 tons to the total crop of the year, and increased its cash value, based upon the low average price of \$8.54 per ton for 1894, by \$353,575,090.

The hay crop in the United Kingdom of Great Britain was a disastrous failure in the year 1893. As a consequence, the United States sold to the British during that year 124,390 tons of hay, while during the year 1895 we have exported to that country only 28,056 tons. On October 15 of this year prices of hay in London were \$12 to \$20 a ton.

Though a superior article from the United States or Canada was sold upon that date at about \$20 a ton, it is not expected that this price will encourage exports from this country, where the 1895 crop is below an average.

VEGETABLE PATHOLOGY.

The work of this division, of which Prof. B. T. Galloway is chief, has been broadened during the year to include plant physiology. It is believed that this will add materially to the value of the investigations. Owing to the crowded condition of the main building and the need of necessary facilities for work, new quarters were secured for the division early in February. The buildings now occupied are situated only a short distance from the Department proper, and are provided with necessary facilities for laboratory investigations. A greenhouse for conducting experimental work has also been provided. This adds greatly to the opportunities for work, especially in matters of interest to florists, market gardeners, and all others engaged in intensive agriculture. Work commenced last year on wilt diseases, which affect the potato, tomato, eggplant, and cotton in the South, and it is progressing satisfactorily. Experiments carried on in the field, laboratory, and greenhouse have thrown much light on the causes of the diseases and the best methods of preventing them.

It is most pleasing to announce that the work on pear blight, which has been under way for some time, has evolved a thorough knowledge of the organism which causes that disease, and also in the discovery of a means to easily and cheaply prevent it. A bulletin on the subject is in the course of preparation, and will soon be ready for distribution.

During the year over one thousand varieties of wheats were tested by the division; the object sought being to discover their respective values in the matter of resisting rust and in their milling qualities. Crosses have been made with some of the more promising forms. They will be given a further trial and on a more extended scale.

The work on citrus diseases has been continued with very satisfactory results. Remedies and preventives for a number of the most serious have been found, and these findings will soon appear in a bulletin.

On the Pacific Coast, diseases affecting the peach, almond, apricot, apple, and grape have been studied. A successful method for the prevention of peach-leaf curl has been discovered, and a detailed account thereof will soon be published.

The complete and instructive exhibit of the division at the Atlanta International and Cotton States Exposition will, it is believed, be very useful to farmers, fruit growers, and others. In this exhibit the diseases affecting cotton, citrus fruits, and other crops of special interest to the South, are made a special feature.

POMOLOGY.

This division has continued, under the direction of its chief, Mr. S. B. Heiges, the systematic examination and comparison of supposed new varieties of fruits sent to it for identification, and has prepared careful studies and descriptions of the new specimens, illustrating them in most cases either with water-color sketches or colored models. These descriptions are carefully filed and must in time prove of great value. They will eventually make it possible to publish an authoritative work on the fruits of the United States.

The introduction and distribution of new varieties of fruits have been continued, the effort, however, being confined to the comparatively few varieties of fruits of great value not at present found in our country, but promising to do well here. Cions of many of these have been placed with experiment stations and sent to private experimenters for the purpose of determining their adaptability to various sections.

NEW VARIETIES OF FRUITS INTRODUCED.

Among the more important varieties that have been introduced are 65 new specimens of figs received from the Royal Horticultural Society of England. For the present these varieties are being propagated in different places for the purpose of testing further their adaptability to our climate and soils and for producing a larger number of cuttings for distribution. It is believed that there is a large area of country within the United States adapted to the growth of figs and that it will be sufficient to supply our entire demand for this delicious fruit.

Other important importations consisted of 29 varieties of the choicest apples of Austria-Hungary, which have been grafted upon seedling stocks for the purpose of propagation. It is proposed to distribute these trees to the experiment stations as soon as they are in proper condition. Efforts have also been made to introduce improved and hardy varieties of persimmons from northern China and the citron of commerce from Italy.

EXPERIMENTS IN ROOT-GRAFTING APPLE TREES.

Considerable experimental work has also been undertaken. Prominent among these tests are experiments made with full-rooted and top-cut and lower-cut grafting in the propagation of apple trees. These experiments will be continued, and possibly on a larger scale. It is intended that trees grown from grafts as above described be distributed in different States and localities for testing. Varieties varying in habits of growth and longevity will be chosen. Generally they will be of standard varieties, like the Winesap, Albemarle Pippin, Ben Davis, Oldenburg, Jonathan, and Northern Spy. Under this system of experimentation a few years will demonstrate whether whole roots, top cuts, or bottom cuts for grafting cions upon are most conducive to vigor of growth and longevity.

Special effort is being made to interest the State experiment stations in these and similar subjects and to secure their assistance in collecting new and comparatively unknown varieties of fruits. It is desired to develop some regular plan of cooperation by which the horticulturists of these stations shall collect new seedling varieties or other novelties and forward them to this division for identification, description, illustration, and preservation. Some central record office of this kind is absolutely necessary, and should be located in the Department of Agriculture.

FRUIT IN COMMERCE.

EXPORTS OF APPLES.

The economic value of apples for export is becoming more generally known to the horticulturists and farmers of the United States. Each year their exportation to Europe increases in quantity, quality, and value. Good winter apples, carefully selected and properly packed, always meet with a favorable reception and command good prices in Great Britain and on the Continent. Among the best known of American varieties on the other side of the water are the Baldwins, King of Tompkins County, Ribston Pippins, Northern Spy, and various russets. But there is no doubt that the Winesap, Jonathan, Greening, Ben Davis, and Vandever Pippin, together with many other well-known varieties from the orchards of the United States, would be very acceptable and always secure for their shippers fair prices and profits. The most successful shipments of apples are made in New York barrels, which carry about 3 bushels and weigh about 112 pounds. The freight upon each of these barrels from American to European ports averages less than a dollar. During the fiscal year ended June 30, 1895, we shipped 818,711 barrels of apples abroad, valued at \$1,954,318.

The following table shows our exports of apples, green or ripe, and dried, for the fiscal years ended June 30, 1893, 1894, and 1895, and the three months ended September, 1895:

Year.	Green or ripe.		Dried.	
	Barrels.	Value.	Pounds.	Value.
1893.....	408, 014	\$1, 097, 967	7, 966, 819	\$482, 085
1894.....	78, 580	242, 617	2, 846, 645	168, 054
1895.....	818, 711	1, 954, 318	7, 085, 946	461, 214
Three months ended September, 1895.....	31, 093	74, 127	1, 387, 842	69, 427

Export shipments of apples from any of the States east of the Rocky Mountains can be made remunerative. The apple among fruits is as staple and universally demanded as beef among meats. The variety which has sold for the highest price in British markets is the Albemarle Pippin, which is successfully grown to its greatest perfection in the State of Virginia. This variety has at times netted the growers

\$7 a barrel in the orchards. It is a remarkably fine keeper, of delicious flavor and beautiful coloring. The profits of intelligent horticulture along the Atlantic Seaboard can not well be overestimated. The success in foreign marts of the Pacific States fruit growers and shippers, laboring under the disadvantage of a rail carriage from the Pacific to the Atlantic, should stimulate all horticulturists this side of the Rocky Mountains to further secure sales for their products in Europe. The peaches of Delaware, Maryland, and most of the Southern States along the Atlantic Coast would certainly reach the London market in as good condition, if properly put up, as those from California.

CALIFORNIA FRUITS IN ENGLISH MARKETS.

California fruits have made marked gains in European markets during the last year. This trade began three years ago by a shipment on the White Star Line, which consisted of pears, peaches, plums, and grapes. The sale of that invoice at Covent Garden Market attracted public attention at the time, and the prices were so remunerative as to encourage further shipments. The succeeding year, however, satisfactory terms could not be made for railroad and steamship transportation; consequently no shipments of California fruits were made during those twelve months to transatlantic markets.

But in the year 1894 the American Steamship Company carried over quite a number of fruit invoices. The results were satisfactory generally as to prices and profits upon the pears and peaches, while the traffic in grapes was not such as to induce further shipments of that fruit from the Pacific Coast.

A representative of the Department of Agriculture during the past summer attended the California fruit sales at Covent Garden. From that attendance he concludes that the California Fruit Transportation Company has solved the freight problem and that only the finest quality of fruit can be remuneratively sent abroad; even then sound condition and careful packing, and their arrival at London between the 1st day of July and the last day of August, can alone secure the best prices in competition with English and Continental growers.

During the year 1895 the first lot of California fruit arrived in London on the 1st day of July. It met competing fruits from southern France, the Channel Islands, and Spain, together with fair specimens of English products, in a very propitious season. On that date fine English hothouse peaches sold at 15 cents each, with fair to common qualities at 5 to 3 cents each. All of the California fruit arriving on the date mentioned above consisted of Bartlett pears (in England called the Williams pear) and of peaches. They arrived in fine condition and the Bartletts brought from \$5 to \$6.25 per box of 50 pounds, and the peaches sold at an average of \$2.50 per box of 25 pounds. The pears retailed at from 4 to 5 cents each, and the peaches at from 6 to 12 cents.

The second arrival in the same market of California fruit was July 15. At this date the pears brought from \$3 to \$3.50 per box of 50 pounds, and the peaches and plums from \$1.70 to \$2 per box of 25 pounds.

The third arrival was on August 1, when the peaches and pears commanded about the same prices as in the previous shipments to the same market.

The fourth California fruit invoice was received in London the middle of August. It was an unusually large consignment and consisted of 10 carloads. Pears in this lot, in perfect condition, sold as high as \$2.80 per box. The peaches brought only \$1 to \$1.50 per box.

The fifth shipment of Pacific Slope fruit arrived in England on the last day of August. The late peaches were in very fine condition and gave the best satisfaction to dealers, but the prices were not as good as expected, as they ranged from \$1.20 to \$1.80 a box, according to quality. The pears ran from \$1.50 to \$3 per box.

The sixth shipment reached London in the month of September, via Southampton, where it was unloaded from the steamer *Paris* on Wednesday night and placed on sale in Covent Garden Market on Friday morning. Buyers were eager to get hold of the late pears. They were in great demand, because of the satisfaction which the fruit of the two previous shipments had given. A large number of intending buyers were gathered about the auctioneer. The liveliest interest was displayed. The fruits were divided into lots representing different growers, one kind of fruit in each assortment. The boxes, made of the lightest possible durable material, were labeled with the names of the respective packers. The peach boxes contained 25 pounds. Each peach was wrapped in white paper, single thickness, a little heavier and tougher than tissue paper. The plums, not wrapped singly, were in similar boxes divided into small compartments. The pears were in 50-pound boxes and separately wrapped, though pears in 25-pound boxes bring a much better price. Under this system of selling, the reputation of some growers commanded special interest and higher prices from buyers. Those who desire to maintain a high standard of excellence, and decline under any temptation to send inferior fruits, and who use the most scrupulous care in packing, find their reward at last in a reputation which commands enhanced prices for their products.

The average quality of the peaches at this sale was very good. The Orange Clings seemed to be a favorite, while the late Crawfords in fairly good condition and Strawberry peaches did not seem to stand the transportation as well. The fruits from the hill counties of California were in firmer and better condition than those from the valleys.

Among pears the Beurre Clairgeau and Hardys arrived in excellent order and brought prime prices, while some Bon Chrétien were also highly appreciated.

For a new branch of international commerce—one requiring great care and perfection in shipments—the exportation of California fruits

to London has been quite as successful as could have been expected. The business is in its infancy, and has, if properly managed, a profitable future. Shippers must remember that there is always a market in London for such luxuries; that no fruit should be sent there except when in perfect condition and properly packed, and that, generally, prices will be more remunerative for early fruits. However, shipments were to arrive in London in September and October of this year, and it is possible that they will show better prices than some of the others, because they will meet with less competition from English and French and other Continental fruits.

Fruit growers on the Pacific Coast, however, have special opportunities open to them in foreign markets for dried fruits, prunes, and raisins, and for brandies and wines. These particular industries need only be cultivated with energy and intelligence to achieve great results, and their development is earnestly commended to growers in that section.

ENTOMOLOGY.

The work of this division, of which Mr. L. O. Howard is chief, is grouped under the following heads: Investigations upon special insects; experiments with insecticides and insecticide machinery; determination of insects sent in by agricultural experiment stations and others and giving advice with regard to them; abstracting and cataloguing the literature of insects; scientific work upon groups of insects which have a bearing upon agriculture; special investigations. It will only be possible to mention here a few of the many valuable services rendered by this division.

THE MEXICAN COTTON-BOLL WEEVIL.

A new insect (*Anthonomus grandis*) which appeared in the cotton fields of south Texas, damaging the squares and bolls and ruining both fiber and seed, received especial attention during the year. The insect was found to be a species which had been brought across from Mexico, and so was commonly called the Mexican cotton-boll weevil. Through an agent sent into southwest Texas and into Mexico to study the history of this insect a careful investigation of the subject was made and a preliminary report has been published for the purpose of giving the people of this section proper warning. A complete report will be published during the coming winter. It is now hoped that the early fears as to the possible spread of the species throughout the entire cotton belt of the United States will not be realized, and that a tolerably efficient remedy for the prevention of the spread of the insect in south Texas has already been ascertained.

THE SAN JOSE SCALE.

Special efforts have been made to ascertain the exact points in the Southern States at which the San Jose, or pernicious, scale of fruit trees had established itself, and extensive experiments have been carried on

for the purpose of ascertaining the best methods of combating this very destructive insect. Some progress has been made, and a bulletin on the subject will be published at an early day. In connection with this investigation, new studies have been made of all the principal scale insects of the orchard.

The edition of the report published ten years ago on insects affecting the orange having been exhausted, a new report on this subject has been ordered and is now rapidly approaching completion. This report will include consideration of all insects which affect citrus plants in other parts of the world than the United States, as they are all liable to be introduced into our country.

APPEARANCE OF INSECT PESTS.

Research has been made to determine the geographic distribution of injurious insects appearing in devastating numbers. The localities in which they have appeared have been platted and the records of their damages carefully collated. With such data in hand, the entomologist will be able to predict the geographic lines at which the progress of certain species will stop and to advise agriculturists with some degree of certainty as to the possibility of the appearance of well-known insect pests in any given locality. The minor subjects of investigation have been insects injurious to shade trees, local outbreaks of the American and other locusts in different parts of the country, the cotton or melon plant louse, the currant stem girdler, etc.

The work of this division in bee culture has been concluded with the completion of the manual on apiculture, which is now going through the press.

Experiments with insecticides and insecticide machinery cover such subjects as the effect of different arsenical poisons upon insects and upon the foliage and other parts of plants, the use of hydrocyanic acid gas against insects, new devices for spraying, etc.

Since the new insects which sprung into prominence as destructive species have to be classified, described, and named before they can be intelligently considered in popular publications, several competent assistants are preparing monographs on groups of such insects.

ORNITHOLOGY AND MAMMALOGY.

The name of this division is unfortunate, as it conveys an erroneous idea of the nature of its work. The division, of which Dr. C. Hart Merriam is chief, is in effect a biological survey, and should be so named, for its principal occupation is the preparation of large scale maps of North America, showing the boundaries of the different faunas and floras, or life areas. In fact, Congress, in 1890, authorized this division to undertake a comprehensive investigation of the geographic distribution of animals and plants; thus in effect establishing a biological survey. These maps when completed will show the farmer and fruit

grower the areas on which particular kinds of grasses, grains, vegetables, and fruits may and may not be cultivated with success; thus saving the large sums of money now expended annually in futile efforts to make crops grow in places climatically unsuited to their needs. They will be further useful in indicating the areas subject to and those exempt from the ravages of destructive insects and other pests, and also those in which certain diseases of plants and animals are likely to flourish.

Within the Department these maps are helpful in many ways, serving as an intelligent basis for that part of the work of the divisions of Forestry, Botany, Agrostology, Pomology, Entomology, Vegetable Pathology, and Bureau of Animal Industry which relates to the geographic distribution of the forms they study.

In the preparation of faunal maps three kinds of work are necessary: (1) Field work, in collecting specimens and tracing the actual limits of distribution by running lines across the country; (2) office work, in platting on maps the results of the field work; and (3) laboratory work, in determining the status of animals in groups that have not been worked up; for it is obviously impossible to map the distribution of a species which has not been discriminated from related species that may inhabit adjacent areas.

So far as preliminary work is concerned the biological survey has been already extended over the greater part of the United States except eastern Oregon, north and central Nevada, parts of New Mexico and Texas, and some of the Eastern States. In addition, a detailed survey has been made, with a degree of accuracy equal to or exceeding that of the best topographic maps available, of large parts of California, western Oregon and Washington, Idaho, Montana, Wyoming, South Dakota, Utah, Arizona, and a number of the Southern States.

Of all the life zones entering the United States, the Austral, which covers the southern tier of States and much of California, is of greatest importance, because of the large number of specially valuable crops—as cotton, rice, sugar cane, the citrus fruits, raisin grape, fig, olive, and almond—that grow within it. The northern boundary of both arid and humid divisions of this zone have been followed completely across the continent and shown on maps prepared by the division. The final maps of the life zones, when available to the intelligent farmer and fruit grower, are likely to save the country each year far more than the total cost of maintaining the division.

The more strictly economic work relates to the food habits of our native birds and mammals. These are studied in the field and their stomachs are examined in the laboratory in order to ascertain the normal food of the different species. In this way the beneficial kinds are known from the injurious, and the results are published in special bulletins. Those thus far issued treat of the English sparrow, crow, crow-blackbird, woodpeckers, hawks and owls, pocket gophers, and ground squirrels.

AGRICULTURAL SOILS.

This division, which was organized eighteen months ago as a division of the Weather Bureau, with Prof. Milton Whitney as chief, has now been taken out of that Bureau in accordance with the recommendation of the Secretary of Agriculture and the act of the last Congress and given an independent organization. As also provided in the appropriation act it is now accommodated in a building convenient to the Department, which was rented and rearranged for its special use.

ADVANTAGES OF SUBSOILING.

While the Division of Chemistry has been making a study of the chemical properties of soils and of the bacteria which prepare nitrogen for plants, this division has been investigating the physical and mechanical properties of soils. It is rarely that a new line of work like this proves as fruitful of good results in such an early stage of its operations. By it public attention has been called to the fact, for example, that irrigation has frequently to be resorted to solely for the lack of proper preparation of the soil to receive and hold the winter and spring rains. The gradual destruction by cultivation of the humus stored in the prairie soils has made them less and less retentive of moisture, and thus created the necessity for different methods of culture which shall enable them to hold water for the crops. The diminished rainfall several years in succession has also thoroughly disposed the farmers of the West to consider any well-conceived measures or recommendations for the amelioration of existing conditions. The work of the Division of Soils in calling attention to and emphasizing the fact that at least a partial remedy for this condition is to be found in subsoiling, has attracted widespread attention and been followed by most gratifying results. Several of the experiment stations, notably that of Nebraska, have undertaken similar investigations and made practical studies of subsoiling, and the practice is gaining in favor so rapidly that leading plow manufacturers are making plows especially for subsoiling purposes.

Other subjects which have occupied the attention of this division were the examination and classification of soils of some of the principal agricultural areas of the country, the working out of methods for the study of the physical properties of soils and the effect of fertilizers thereon, and the adaptation of soils to particular crops.

THE STUDY OF LOCAL SOILS.

Under the instruction of the Secretary of Agriculture the division is cooperating with a number of States in the study of their local soils and their conditions. A regular system of soil observation is being organized by the employment of observers in the principal agricultural

regions of the country, and the records of their results are tabulated and published for the information of those interested.

The Secretary of Agriculture believes that it is by work of this practical character that the Department can promote the great interests it is designed to serve.

IRRIGATION INQUIRY.

Mr. C. W. Irish, chief of the Office of Irrigation Inquiry, has devoted much time to the further personal examination and investigation of the different methods of irrigation practiced in Utah, Nevada, Nebraska, and some of the arid and subhumid regions. He has not yet completed his report; but considerable progress has been made with it, and it is believed that the Department will speedily be in position to render important didactic service to that large and increasing body of agriculturists who are farming irrigated lands. Inquiries are received from time to time as to the best methods of overcoming the various difficulties that are encountered in the artificial application of water to soil under the widely varying conditions which obtain in the far West, and the most reliable information in the possession of the Department is promptly afforded to the thousands who seek it. The Secretary of Agriculture realizes that only by irrigation can many of the richest soils of the United States ever be successfully brought under cultivation, but he strongly deprecates any appropriation of the public money or any alienation of the public domain as a subsidy for the attempted solution of irrigation problems, which are, in his opinion, pressed upon the country years before their time and years before the best interests of the country can be served by their consideration and determination. With almost a superabundance of agricultural products in our home markets at reasonably low prices, public funds out of taxes gathered largely from existing farms and farmers can not justly be appropriated from the Treasury of the United States to create competing farms.

ROAD INQUIRY.

The work of this office under Gen. Roy Stone, chief of Road Inquiry, has proceeded steadily during the year, in accordance with the provisions of the act making the appropriation, and has included investigations in regard to the best methods of road making, road legislation, and especially the condition of the country roads of the United States.

Improved road construction is progressing in many of the States, notably in Massachusetts, New Jersey, North Carolina, and Kentucky. More than half the States have passed new road laws within the last year, and there is a general effort to ascertain the best methods for developing the country roads, for using the county prisoners or State convicts for this purpose, and for organizing State commissions to look after these matters.

Special attention is called to the results of the inquiry made by this office into the cost of hauling farm products to market, compiled from data received from 1,160 counties, contained in the report of the special agent in charge, accompanying this document. The facts cited show lucidly the great expenses entailed by bad roads, and the great value of good ones, and should do much to awaken the farmers of this country to the importance of this subject.

The office is also compiling a national map, on a large scale, to show all the macadamized and gravel roads in the United States. Upon this map new roads are laid down as fast as they are built and reported to this office by the county clerks or surveyors. Such a map will, when finished, be of great value. The maps of Pennsylvania, Indiana, and New Jersey are already sufficiently advanced to present most interesting facts, and those of other States are progressing.

The office has published directions for building improved roads, compilation of road laws, information regarding road material and transportation rates for the same, the proceedings of road conventions, and much other useful information for free distribution among the people.

It is proposed during the coming year to secure the cooperation of agricultural colleges and experiment stations in the object-lesson method of disseminating this information. They will be taught to construct model roads on the farms of their experiment stations or on their college grounds, where they can be regularly used, and thus become a lesson to all the farmers who visit them.

Public interest in the whole subject of road improvement has become thoroughly aroused, and a feeling of great hopefulness has been developed. The usefulness of a central good-roads propaganda such as this office affords has been amply illustrated.

FIBER INVESTIGATIONS.

The decline of the price of cotton and the successful establishment in this country of ramie manufacturing has called increased attention to the cultivation of this plant. Correspondence with reference to it has been very large, and has necessitated the publication of a special report on the subject in addition to the paper in the last Yearbook. The great desideratum is still a practical ramie decorticating machine. Recognizing this, the Department has endeavored, in the line of its duty, to assist by study and suggestions in perfecting practical apparatus for this purpose. In cooperation with the Louisiana experiment station it has tested a number of new machines. These trials showed gratifying progress in their construction, and though they have not yet produced a perfect machine, it is confidently believed that American inventors will at last successfully solve this problem.

Experiments in the production of flax in the region of Puget Sound, Washington, have been continued during the year on a larger and more comprehensive scale with the cooperation of farmers in several sections

of the State. Some very fine samples of straw have been submitted, which encourages a hope for satisfactory final results. The interest in the profitable growth of flax has been much stimulated in this region. In evidence it is said, that a considerable area will be planted with this crop next season. In furtherance of this interest, a Farmers' Bulletin was published on "Flax for Seed and Fiber," which has been successfully circulated with good results in sections interested.

Other fibers which have been subject to more or less inquiry are sisal hemp, pineapple fiber, jute, and the common hemp of the North.

A descriptive catalogue of the world's fibers is in preparation, by Mr. Charles Richards Dodge, the special agent in charge of this work.

MICROSCOPY.

The Division of Microscopy was established in the Department of Agriculture twenty years ago, when this art was considered a separate branch of technology. Since that time the microscope has come into daily, almost hourly, use in nearly all scientific laboratories. A separate Division of Microscopy in this Department has thus become an absurdity. The Department of Agriculture during the last fiscal year used at least 500 microscopists of one class or another outside of the Division of Microscopy to the one in it. This division, having completed a line of investigations on edible fungi, the butter fats used for adulterating purposes, the textile fibers, and one or two other subjects which it had undertaken some years ago, was abolished on the 1st of July, 1895. The apparatus and material pertaining to fungi were turned over to the Division of Vegetable Pathology, which makes a special study of fungi and fungous diseases of plants; the material pertaining to food adulterations was turned over to the Division of Chemistry, which by law is charged with the investigation of this subject; and the material belonging to textile fibers was turned over to the Office of Fiber Investigations. These divisions will continue to attend to any investigations needed under these heads.

PUBLICATIONS.

The Division of Publications is in charge of Mr. George William Hill, who has managed and directed its affairs from the day of its inception. During the fiscal year, under his vigilant supervision, 254 publications have been issued, including 120 reprints. The total number of copies of bulletins, pamphlets, and other publications aggregates more than 4,000,000. Together they make 420,000,000 printed pages, each page containing more than 500 words. Thus the Department of Agriculture has issued in a single year, gratuitously and promiscuously, under present laws, more than six printed pages for every man, woman, and child in the United States. This vast volume of reading matter, given free of cost to all who asked for it and mailed postage free to the

donees wherever they might be, caused the disbursement of a large sum of public money for paper and printing alone. The regular annual report, averaging nearly 40 ounces per volume, made more than 600 tons weight for gratuitous delivery, in the various States and Territories, by the Post-Office Department.

A careful comparative estimate shows that the total weight of publications, other than the annual report, aggregated 200 tons. Thus this Department alone has given 800 tons weight to the postal authorities for gratuitous transportation.

GRATUITOUS DISTRIBUTION CONDEMNED.

In view of the above facts it is again recommended that all publications issued by the Department be furnished to such citizens only as will pay for their net cost and added postage, and that gratuitous distribution be confined to public libraries and benevolent and educational institutions, with the exception of such publications as may be for specific purposes and properly termed "exigency" or "emergency" documents. Under the present system many secure publications who do not need them for practical purposes, and those who would put them to good use are frequently unable to get them because editions have been exhausted by the former class. To-day almost any Government publication, no matter when it was published or how rare or valuable it may have become, can be purchased in second-hand and other bookstores in nearly all the larger cities of the country. There is not time to detail here the extravagance and needlessness of the present system. At this writing the Department has knowledge of the sale of the Yearbook issued in September by booksellers, and learns of the proposed sale of the same in large lots at \$5 per 100. It is enough to suggest that the annual deficiencies of the Post-Office Department are largely attributable to this unwise distribution. With great satisfaction reference is made and public attention called to the report of the chief of this division.

SEED DIVISION.

Under the direction of Mr. M. E. Fagan, chief of the Seed Division, there were gratuitously and promiscuously distributed during the last fiscal year, in accordance with a long-prevailing practice, about 10,000,000 papers of flower and vegetable seeds. His report, together with that of Enos S. Harnden, the authorized purchasing agent of seed for the Department, is submitted and published. Together they give a detailed account of the purchase and distribution of the seed, which involved the deadheading in the United States mails of 270 tons weight.

After the adjournment of the Fifty-third Congress inquiry was made at the Department of Justice as to the legality of purchasing any other than seeds "rare and uncommon to the country," etc. The following

letter from the honorable the Attorney-General of the United States answered and settled the question:

DEPARTMENT OF JUSTICE,
Washington, D. C., April 20, 1895.

THE SECRETARY OF AGRICULTURE.

SIR: I have the honor to acknowledge yours of the 18th instant, in which you call my attention to a portion of the act making appropriations for the Department of Agriculture for the fiscal year ending June 30, 1896, and approved March 2, 1895, and running as follows: "*Division of Seeds—Purchase and distribution of valuable seeds, and for the printing, publication, and distribution of Farmers' Bulletins: For the purchase, propagation, and distribution, as required by law, of valuable seeds, bulbs, trees, shrubs, vines, cuttings, etc., one hundred and eighty thousand dollars.*"

You make two inquiries, as follows:

"Can the Secretary of Agriculture legally purchase any other seeds than those described in section 527 of the Revised Statutes, to wit, seeds 'rare and uncommon to the country, or such as can be made more profitable by frequent changes from one part of our own country to another,' under authority of the act of March 2, 1895?"

"Would it be proper and lawful for the Secretary of Agriculture, in view of the verbiage of the act of March 2, 1895, and the wording of section 527 of the Revised Statutes, to advertise for proposals to furnish the Department of Agriculture seeds, bulbs, trees, vines, cuttings, and plants 'rare and uncommon to the country, or such as can be made more profitable by frequent changes from one part of our own country to another,' reserving the right to reject any and all bids?"

1. The seeds purchasable under the act of March 2, 1895, are limited to those described in section 527 of the Revised Statutes—there being no reasonable ground for claiming that the act of March 2, 1895, operates, or was intended to operate, as a repeal of the earlier statute.

2. If not obligatory upon the Secretary of Agriculture to purchase seeds, trees, etc., conformably to section 3709 of the Revised Statutes, it is certainly competent for him to make the purchases conformably to said statute, the right to reject any and all bids being reserved. But the form of the question is such that I think it proper to call attention to the fact that while seeds purchased must be such as are "rare and uncommon to the country, or such as can be made more profitable by frequent changes from one part of our own country to another," the trees, plants, shrubs, vines, and cuttings to be purchased are such "as are adapted to general cultivation and to promote the general interests of horticulture and agriculture throughout the United States."

Respectfully, yours,

RICHARD OLNEY, *Attorney-General.*

And the following advertisement was immediately inserted in the legally required number of newspapers:

PROPOSALS.

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., April 27, 1895.

In accordance with section 527 of the Revised Statutes, which authorizes the purchase of "seeds rare and uncommon to the country, or such as can be made more profitable by frequent changes from one part of our own country to another," also "such trees, plants, shrubs, vines, and cuttings as are adapted to general cultivation, and to promote the general interests of horticulture and agriculture throughout the United States," and in accordance with the terms of the appropriation (act approved March 2, 1895) for the purchase and distribution of valuable seeds, "as required by law," sealed proposals, in duplicate, subject to the usual conditions, will be received by the Secretary of Agriculture until 2 p. m., July 1, 1895, for supplying

to the United States Department of Agriculture during the fiscal year ending June 30, 1896, and to be delivered before November 1, 1895, such valuable seeds, trees, plants shrubs, vines, and cuttings, as are covered by section 527 of the Revised Statutes quoted above. Persons submitting bids should specify the kind and varieties, with full description of each variety, of seeds and plants upon which they desire to submit bids and the quantities they are prepared to contract for, and must guarantee delivery of the same in Washington. The right is reserved to reject any or all bids.

J. STERLING MORTON, *Secretary*.

There were only three bids made under the above, and they were passed upon and rejected by a committee, as follows:

WASHINGTON, D. C., *July 6, 1895.*

THE SECRETARY OF AGRICULTURE.

SIR: The undersigned board, appointed by you on July 1, 1895, to open and examine bids for seeds to be furnished this Department for distribution according to law, during the fiscal year ending July 1, 1896, have the honor to report that we have opened and examined the bids received and find that the same do not meet the requirements of the advertisement as printed, and therefore respectfully recommend that all bids be rejected.

Respectfully, yours,

ENOS S. HARNDEN.

F. L. EVANS.

J. B. BENNETT.

The various divisions of the Department had been for a long time crowded for want of proper office rooms. Therefore the first story of the large building heretofore mostly occupied by the Seed Division was at once, under the law providing for such emergencies, speedily transformed into apartments for the Division of Entomology and the Division of Ornithology and Mammalogy, and immediately occupied by the chiefs and clerks thereof. In this way the library room of the main building of the Department has been relieved from a congestion of accumulated specimens, books, and other property which heretofore lumbered up the galleries of that room in various unsightly, pine-board partitions. The two divisions named have, for the first time since their existence, been properly housed and decently provided with working rooms suitable to their peculiar labors and lines of investigation.

The detailed showings of the chief of this division, and likewise of the seed purchasing agent, will, in all probability, sufficiently enlighten the general public as to the needlessness and folly of the annual gratuitous, and promiscuous distribution of seeds deadheaded through the United States mails.

The one hundred and thirty thousand dollars appropriated by the Fifty-third Congress for the purchase and distribution of seed this year is entirely intact and consequently undrawn from the Treasury of the United States.

GARDENS AND GROUNDS.

The gardens and grounds of the Department are, as they have been for more than thirty years, in charge of the chief of that division, Mr. William Saunders, horticulturist. The work of the division has

consisted "in keeping the grounds in good condition, in the cultivation and care of the plant and fruit houses, and in the propagation of plants for home use and for distribution."

The free and promiscuous distribution of strawberry and grape vines, privet plants, camphor trees, tea trees, olive trees, fig trees, pine-apples, and miscellaneous varieties of cuttings ought to be abolished. But if the propagation of rare and valuable plants, vines, and exotics is to be continued by the Department, the distribution should be limited to the experiment stations and agricultural farms of the several States and Territories. By such a limitation the appropriation for this division could be very materially reduced. It is, however, the purpose of experiment stations and agricultural colleges to attend to the introduction of new, rare, valuable, or improved plants, vines, and seeds to their respective localities. Those institutions are in charge of and directed by skilled, scientific agriculturists of great experience. Therefore all of this business of propagating and distributing new varieties should be relegated to those institutions. Before their existence there might have been some excuse for the gratuitous and promiscuous distribution of seeds, vines, plants, trees, and cuttings, but there is no necessity for such distribution at this time at the expense of the Federal Treasury. That being the case, the appropriation for the care of thirty-five acres of grounds about the United States Department of Agriculture and for the greenhouses thereon situated could be very materially and profitably reduced.

ACCOUNTS AND DISBURSEMENTS.

Chief F. L. Evans has submitted a summary of the work of this division for the fiscal year ended June 30, 1895, together with a statement of appropriations, disbursements, and unexpended balances of the United States Bureau and Department of Agriculture from the fiscal year 1839 to and including the fiscal year 1895. His report is entirely satisfactory and could only be evolved from a service of great perfection over which he has with scrupulous economy and vigilance most efficiently presided.

The appropriation for the maintenance of this Department for the year 1895 was one hundred and four thousand four hundred and seventy-six dollars and ninety-four cents (\$104,476.94) less than the appropriation for 1894, and yet it was one hundred and eighty-three thousand four hundred and twenty dollars (\$183,420) more than the amount estimated for by the Department.

For the fiscal year ended June 30, 1893, there were covered back into the Treasury of the United States from the appropriation for this Department one hundred and eighty-five thousand four hundred and ninety-seven dollars and sixty-four cents (\$185,497.64). Subsequently the sum of (in round numbers) six hundred and twenty-five thousand dollars (\$625,000) for the fiscal year 1894 was returned to the Treasury,

and for the fiscal year ended June 30, 1895, there is an unexpended balance amounting to about five hundred thousand dollars (\$500,000).

RECAPITULATION.

Five million one hundred and two thousand five hundred and twenty-three dollars and six cents (\$5,102,523.06) were appropriated to the United States Department of Agriculture during the two fiscal years 1894 and 1895; and out of that sum one million one hundred and twenty-six thousand two hundred and sixty-eight dollars and seventy-four cents (\$1,126,268.74) have been saved to cover back into the Treasury.

Then add to that saved sum the one hundred and eighty-five thousand four hundred and ninety-seven dollars and sixty-four cents (\$185,497.64) returned to the Treasury out of the 1893 appropriation, and we find that, with an unimpaired and extended and disciplined service in this Department, the aggregate sum of one million three hundred and eleven thousand seven hundred and sixty-six dollars and thirty-eight cents (\$1,311,766.38) is available for return to the Treasury since March 4, 1893.

In a government where vast sums are handled every day and tens and hundreds of millions of money are ordinary topics of conversation, the saving of thirteen hundred thousand dollars may attract little attention and less commendation. But in the most fertile farming county in the best agricultural sections of the American Union it will be difficult to find thirteen hundred farmers who all together have earned and saved as much in the same period of time. No other class of gainfully employed workers among the citizens of the United States are so interested in a judiciously economical management of governmental affairs as are the farmers, who directly and indirectly pay the most taxes in proportion to their property, because that property is, as a rule, material and visible. And farmers, more than any other class, ought to know that governments, whether monarchal, despotic, or democratic and republican are born without money and never get any money except by taxing either subjects or citizens, and that a tax is payment by the citizen to the Government for the protection it gives to property, life, and liberty. And further, that neither bankers, railroad owners, manufacturers, farmers, nor any class, can legitimately demand the expenditure of public funds for any other purpose than that for which they were taken from the people.

BUILDINGS FOR THE DEPARTMENT OF AGRICULTURE.

It is suggested that the Weather Bureau could be furnished with commodious offices and apartments in the top story of the new post-office building in the city of Washington, and upon the roof of the same edifice the exposure of all the instruments used in taking meteorological observations could be advantageously made, while a small part

of the basement of the same building, set apart for the printing office and presses whence the daily weather maps are issued would complete a most desirable domicile for that Bureau.

Such a transfer having been made from its present location, the Weather Bureau buildings and grounds at the corner of Twenty-fourth and M streets, in the city of Washington, could be converted into cash and would bring something like \$200,000 or \$300,000. This sum, added to the \$1,300,000 which has been saved and covered into the Treasury from appropriations for the Department of Agriculture for the fiscal years 1893, 1894, and 1895, makes \$1,500,000, which, invested in a building constructed purposely for the Department of Agriculture, would afford in compact form sufficient accommodations for every one of the divisions and bureaus and bring them in daily communication with each other. Under the present system of renting (rents now amounting for this Department to \$3,920 a year) the expenses are increasing, and the necessity of having all the divisions and bureaus, especially those of a scientific character, brought together, is becoming more and more obvious.

In view of these facts, if the Department of Agriculture is to be domiciled, as every other Department is, in a building proportioned to the value and magnitude of the interests which it conserves, it is suggested that an appropriation for the construction of an edifice for the Department of Agriculture must be made in the very near future.

EXTENSION OF THE CIVIL SERVICE.

By Presidential order, on May 24, 1895, all the employees of the Department of Agriculture, with the exception of three persons holding office by appointment of the President and of some 500 laborers and workmen (not skilled) and charwomen, were included in the regularly classified civil service. Of the 500, only 78 laborers are in Washington. Of employees included in the classified service only four are excepted from the rule requiring appointment by competitive examination or by promotion. That order, therefore, put all the educated and skilled force of specialists and scientists, including all the chiefs of division of this Department, into the classified service.

The total number of employees is 2,019. Four hundred and twenty-nine are females. One hundred and sixty-five out of the whole number were appointed after civil-service examination and certification. Thirty-three of this number are women.

From the date of the enactment of the civil-service law, January 16, 1883, to March 6, 1893, the number of persons appointed in this Department after examination and certification by the United States Civil Service Commission, under the rules, was 112. Of that number 42 were women.

But since March 7, 1893, the number so appointed has been 102. It lacks only 10 of being as many as had been appointed in accord with

civil-service law and regulations during more than the ten previous years. And since March 7, 1893, only 8 women have been so appointed. Of the whole number of 214 thus brought into the service 49 persons have been severed from the Department by resignation, transfer, or otherwise. Of that total civil-service list 37—25 males and 12 females—have been severed from the service since March, 1893.

A thoroughly economical and efficient departmental service can only be secured and maintained by extending the provisions of the civil-service law so as eventually to include all purely nonpolitical ministerial officers, clerks, skilled workmen, and laborers. This is not the place to discuss in detail the amendments and modifications needed to render the civil service of this Government one of the most enlightened, prompt, and efficient in the world. The subject, however, justly claims space in this report for the expression of the conviction that the service of the Government should be put, in all respects, on as good a footing as that of first-class establishments conducting professional or commercial enterprises.

The present system, awarding unduly large salaries for the simplest clerical work, almost mechanical in its character, invites an influx to Washington of persons seeking work who properly belong to the lowest clerical grade. But unfortunate statutory limitations restrict salaries for the more responsible and important positions, which require special knowledge, to a level 25 or 50 per cent lower than those paid for similar efforts by reputable commercial and professional establishments throughout the country. Radical reorganization is needed, therefore, in these respects. Reasonable remuneration in the subordinate ranks and sufficient inducements in the higher grades to stimulate ambition and suitably reward exceptional merit will, together with permanency of tenure and the responsible character of the employer, attract talent, industry, and character to the service of the Government. Under other conditions, which have been tried, favoritism, injustice, and dependence upon political influence saturate the service with mediocrity, indolence, and inefficiency.

Before dismissing this subject special attention is directed to section 25 of Chapter II in the Vermont constitution of 1793, which embodies on the subject of public officers and office holding in general a specimen of good New England sense which may be studied with advantage at the present time, more than one hundred years after its adoption:

As every freeman, to preserve his independence, if without a sufficient estate, ought to have some profession, calling, trade, or farm, whereby he may honestly subsist, there can be no necessity for nor use in establishing offices of profit, the usual effects of which are dependence and servility, unbecoming freemen, in the possessors or expectants, and faction, contention, and discord among the people. But if any man is called into public service to the prejudice of his private affairs, he has a right to a reasonable compensation; and whenever an office, through increase of fees or otherwise, becomes so profitable as to occasion many to apply for it, the profits ought to be lessened by the legislature. And if any officer shall wittingly and willfully take greater fees than the law allows him, it shall ever after disqualify him from holding any office in this State until he shall be restored by act of legislation.

THE FUTURE OF FARMS AND FARMING IN THE UNITED STATES.

The farms of the United States, averaging 137 acres each, are valued at more than \$13,000,000,000. Those farms number four million five hundred and sixty-four thousand six hundred and forty-one*(4,564,641), and their average value in the census of 1890 is \$2,909.

The farm family, including hired help, averages six persons. By their own labor, with an additional investment upon each farm of about \$200 in implements and \$800 more in domestic animals and sundries (making a total farm plant of \$4,000), those families made for themselves during the year, out of the products of the earth, a wholesome and comfortable living.

The same farmers have with part of their surplus products also fed all the urban population of the United States, poor and rich alike. Cereals, meats, vegetables, fruits, eggs, milk, butter, cheese, and poultry have been supplied the village and city markets of the United States in abundance. It is probably safe to say that more than 40,000,000 of American citizens not living on farms have been so furnished with all the necessities and luxuries known as products of the varied soil and climate of the States and Territories of the Union.

During the fiscal year 1895 the United States exported to foreign countries domestic commodities, merchandise, and products aggregating in value \$793,000,000. The aggregate value of the agricultural products included in that sum was \$553,215,317. Of the total exports Europe received a valuation of \$628,000,000, or 79 per cent of the whole.

Thus American agriculture, after feeding itself and all the towns, villages, and cities of the United States, has also sold in the outside world's markets more than \$500,000,000 worth of products. So the farmers of the United States have furnished 69.68 per cent of the value of all the exports from their country during the year 1895.

But this large number of consumers, consisting not only of our own citizens, but of the citizens of all nations, have not been gratuitously fed, though their supplies have been constant and abundant. With sound money of the least fluctuating buying power—money on a parity with and convertible into gold the world over—American farmers have been remunerated for their products.

The exact amount paid for the products of agriculture consumed in the United States during the year is not known, but it must have aggregated hundreds of millions of dollars. But all products, i. e., those consumed at home and abroad, were in—

1870 (including betterments and addition to stock).....	\$2,447,538,658
1880	2,212,540,927
1890	2,460,107,454

No absolutely credible method of estimating products for 1895 is available at this time, but since production has not increased to any

* The 1893 report of the Secretary of Agriculture erroneously stated the number of farms in the United States at 6,000,000.

considerable extent, and the farm value of many of the chief products has decreased to a remarkable degree, it seems reasonable to assume a decrease in the total valuation of farm products since 1890. Say, as a rough approximation, the valuation is \$2,300,000,000.

In the presence of these facts, in the front of these figures demonstrating that agriculture in this Republic has during the year fed itself, supplied all citizens of the Union engaged in other vocations, and then shipped abroad a surplus of over \$500,000,000 worth of its products, how can anyone dare to assert that farming is generally unremunerative and unsatisfactory to those who intelligently follow it?

How can the 42 per cent of the population of the United States which feeds the other 58 per cent and then furnishes more than 69 per cent of all the exports of the whole people, be making less profits in their vocation than those whom they feed when the latter supply less than 31 per cent of the exports of the country?

For the purpose of illustrative comparison transfer the \$4,000 agriculturally invested in each farm of 137 acres to the choicest Wall street investment. Risk that money in railroad first mortgage bonds, in bank stocks, or any other allegedly safe security which may be found a favorite among shylocks, brokers, plutocrats, monopolists, money-power manipulators, and multi-millionaires, and if it returns 6 per cent it is a remarkably profitable investment in the eyes of capitalists. Therefore \$240 is the annual income.

Follow the transfer of the farm money with that of the farm family to urban residence. Now, with the same labor in the city or village can they attain by hard work every day in the year, adding their wages to the \$240 income, as much of independence, wholesome living, and real comfort as the same amount of money in the land and the same heads and hands working on the soil generously and healthfully bestowed upon them, in the sweet quiet of a home, amidst flowers, trees, fruits, and abundance, on the farm?

But the declaimers of calamity declare that the farms of the United States are sadly burdened with mortgages. The census of 1890, however, develops the fact that on the entire valuation returned for farms there is only a mortgage of 16 per cent. It will be borne in mind, too, that many thousands of acres of mortgaged lands of great value which are returned as farms were such only before they were mortgaged. They were purchased to plat as additions to cities like Chicago, Brooklyn, Kansas City, and Omaha, and ceased to be farm lands as soon as mortgages representing part of the purchase price were recorded. Such lands are, therefore, wrongfully included and returned as farms. They show an aggregate of many millions of liabilities.

On each \$10,000 of rural real estate there is, then, an average incumbrance of \$1,600. And when the fact is recalled to mind that a large part of all farm mortgages is for deferred payments on the land itself, or for improvements thereon, what other real or personal property in

the United States can show lesser liabilities, fewer liens in proportion to its real cash-producing value? Certainly the manufacturing plants of this country, neither smelting works, mills, iron and steel furnaces and foundries, nor any other line of industry can show less incumbrance on the capital invested.

Railroad mortgages represent 46 per cent of the entire estimated value of the lines in this country. On June 30, 1894, 192 railroads were in the hands of receivers; they represent \$2,500,000,000 capital—nearly one-fourth of the total railway capitalization of the United States.

On that date how relatively small was the amount of money in farm mortgages compared to the value of the lands securing them?

During the year 1894, according to the five reports made that year to the Comptroller of the Currency, the average indebtedness to their depositors of the national banks was \$1,685,756,062.45. Besides the above, State and private banks, loan and trust companies, and savings banks owed their depositors during the same period an average of \$2,973,414,101, making a total of \$4,659,170,163.45.

And in this year, 1895, by the responses of national banks to the four calls thus far made upon them by the Comptroller of the Currency, their aggregate indebtedness to depositors is shown to be \$1,719,597,911.33; State and private banks, loan and trust companies, and savings banks show an aggregate indebtedness to their depositors of \$3,185,245,810, making a total of \$4,904,843,721.33.

These figures show an enormous and constant indebtedness of the banks and bankers alongside of which the money in farm mortgages and the debts owed by farmers are relatively insignificant. The debts of railroads, bankers, manufacturers, and merchants entitle them, and not the farmers, to be called the "debtor class" in America.

In 1880, 44 per cent of all Americans engaged in gainful occupations were in agricultural pursuits. Applying the same ratio to the total population we should have a farming population in the United States for 1880 of 22,068,434. The returns of the Eleventh Census show that the rural population has increased by 4,078,422 during the decade 1880-1890. Adding this to 22,068,434 we get a rough approximation of the farming population in 1890—26,146,856, or 42 per cent of the total—and the number of farms in the United States in 1890 being 4,564,641, the average number of persons on each farm would thus, approximately, be 6.

There were in 1890 improved farm lands in the United States representing an area of tilled and productive fields amounting to 357,616,755 acres. At that time the United States contained 65,000,000 people. Therefore, each citizen of the United States, with an equal per capita distribution of farm products, was entitled in the year 1890 to receive the cereals, vegetables, and other products evolved from $5\frac{1}{2}$ acres of cultivated land, less the amount consumed for the maintenance of domestic animals. These figures illustrate the importance of having

some other than an exclusive "home market." No legislation, however encouraging or protective, will be able to create an American demand, appetite, and digestion of sufficient magnitude to consume all that American farmers produce. Human beings capable of eating the food products of even $2\frac{1}{2}$ acres each year have not yet been developed. Until they are or until the population of the United States has been quadrupled, foreign markets for farm products are essential to the prosperity of the plowmen and planters of this country.

It will be observed that between 1880 and 1890 the proportion of the people engaged in agriculture declined 2 per cent, and that to-day there are only 42 persons in rural pursuits to 58 in mercantile, manufacturing, and other callings common to the great populational and industrial centers. Fifty-eight per cent of the people can not always be satisfactorily maintained upon the profits of exchanges among themselves in the villages and cities. Food for all must come from the earth—from tilled fields. The population of the United States in 1915—a quarter of a century after the census of 1890—admitting that the increase will diminish very materially as compared with that of each preceding quarter of a century since the Government was established, will, no doubt, number at least 120,000,000.

The value of farm lands, being governed by the relation of the supply of those lands to the demand for them, will therefore steadily increase. The area or supply remains stationary, or from careless tillage decreases. But the added millions of our population augment and intensify demand. Therefore the prices of farms must in the next twenty years, and possibly in ten years, advance more markedly than those of urban real estate. The owners of fertile fields, however, must understand now that agriculture is swiftly becoming a scientific profession. The more the farmer cultivates his mind the better and more profitably he can cultivate his fields. The Department of Agriculture has expended during each of the last two years a greater per cent of its appropriations in the application of science to farming, to correct tillage and fertilization, than ever before.

Each season teaches anew the imperative necessity of more and more scientific knowledge for those who are to plow and plant profitably. The markets of the world will finally be invaded, captured, and held by those who produce cereals and meats, vegetables and fruits at the least cost, and can therefore most cheaply sell. Competition is fiercer every year. American inventions, improved implements and machinery for saving labor on the farm and for saving the fruits of that labor are exported to Africa, Europe, and South and Central America. Thus our own recipes and contrivances for cheap production are used abroad to strengthen the abilities of foreign farmers to contend with our own in foreign markets. Information direct from Russia, from Argentina, and from Africa tells of larger sales of American agricultural implements and machinery in each country each year.

Thus competition is made far more formidable by the increased use in foreign parts of our own improved machines and implements with which American manufacturers more than ever are supplying them. In view of such a state of facts, farmers must, to be successful, study probable demand and adjust supply to its needs. Forecasts of markets and their conditions can, by diligent study and attention, be so accurately made as to nearly always secure producers against loss. The profits of planting must largely become premeditated. The struggle to obtain for the offerings of the American farmer the markets of the globe is fiercely carried on between him and every other farmer in all the world. They are brothers in agriculture, as were Abel and Cain, "bringing the "fruits of the ground" for approval. He who brings the best and cheapest will find approval in welcoming purchasers and remunerative prices. The success of the farmer of the future therefore depends more upon mental than upon manual effort.

An act of Congress approved May 15, 1862, creates—

A Department of Agriculture, the general designs and duties of which shall be to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word.

And the foregoing report, in conformity to the spirit and letter of that law and in accord with the educational design and scope of the Department, is respectfully submitted, with the belief that in it may be found "useful information connected with agriculture in the most general and comprehensive sense of that word."

J. STERLING MORTON,
Secretary.

DEPARTMENT OF AGRICULTURE,
Washington, D. C., November 15, 1895.

REPORT OF THE CHIEF OF THE WEATHER BUREAU.

SIR: I have the honor to submit a report of the operations of the Weather Bureau during the year ended June 30, 1895, prepared from the reports of the Bureau as turned over to me upon assuming office, July 4, 1895. I submit, further, a plan of the work as outlined for the current year, and, in conclusion, submit estimates, based upon such plans, for the operations of the ensuing fiscal year.

Very respectfully,

WILLIS L. MOORE,
Chief.

Hon. J. STERLING MORTON,
Secretary.

OPERATIONS FOR THE YEAR ENDED JUNE 30, 1895.

The following is a statement of the appropriation, expenses, and receipts of the Bureau for the year:

Appropriation	\$878,438.84
Expenses	820,936.10
Balance of appropriation.....	57,502.74

In addition to the above the following sums were received from various sources and deposited in the Treasury:

Condemned property, waste paper, etc.....	\$969.68
Sale of publications.....	77.99
U. S. Seacoast Telegraph Line receipts	4,450.90
Total deposited in Treasury.....	5,498.57

DUTIES OF THE FORECAST DIVISION.

This Division has charge of the Forecast work both at the main office and at the stations, including the issue of wind-signal orders and cold-wave, frost, and flood warnings, and the verification of forecasts and warnings, the supervision of the wind-signal display, special river, and rainfall stations, the publication and distribution of the maps and meteorological bulletins issued on stations, the Tropical hurricane reporting stations, and the Washington meteorological station.

FORECASTS.

The twice-daily forecasts have been issued as usual during the year, for the same periods and territory as for the preceding year.

The forecasts for the territory east of the Rocky Mountains have been issued from the Washington office, except that beginning with October, 1894; the morning forecast for Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, North and South Dakota, Montana, Wyoming, and Colorado has been issued exclusively by the official in charge of the Weather Bureau office at Chicago, Ill.

The forecasts for California, Nevada, Arizona, and Utah have been issued by the official in charge of the Weather Bureau office at San Francisco, and those for Oregon, Washington, and Idaho by the official in charge at Portland, Oreg.

Storm warnings have been telegraphed to the lake and seacoast stations and to the director of the Canadian Meteorological Service at Toronto, warnings of frost to fruit, cranberry, tobacco, cotton, and sugar regions, and warnings of severe local storms, cold waves, northers, and dangerous floods, to the threatened districts.

A large number of specific instances are cited in the annual reports of the observers, where the forecasts have been the direct means of saving large amounts of property of various kinds, the value amounting in the aggregate to many thousands of dollars. Following are among the more notable of these extracts, viz:

San Francisco, Cal.—The raisin industry of this State is absolutely dependent upon the Weather Bureau for success. The high-grade crop is sun dried, and if it becomes wet by rain its market value falls below the cost of production. An unexpected rain during the drying season means a loss of hundreds of thousands of dollars. Such losses were prevented by warnings of this office last year. What is true of raisins is true, but to a less degree, of all drying fruits, which is one of the greatest industries in California. Frost warnings in this State are of inestimable value. Warnings of this character this spring, when fruit was in blossom and setting, were doubtless worth hundreds of thousands of dollars. I have been informed of one person, near Red Bluff, who smudged his orchard in response to the warning received, and his crop is now double that of his neighbor who paid no attention to the warning, showing a gain to him of several thousand dollars. These warnings are equally, if not more, valuable in winter to orange growers.

St. Paul, Minn.—Estimated money value saved to shippers and dealers in fruit on account of cold-wave warnings, \$100,000 annually in the last two years. Many thousands of dollars saved to railroad men.

Minneapolis, Minn.—The total number of cold-wave warnings displayed during the year was 19, and they gave excellent satisfaction. It is estimated that fully \$100,000 worth of property alone was saved in this vicinity by means of these warnings.

Raleigh, N. C.—The warnings of the severe cold waves in February, 1895, were of great value to the railroad men, as precautions were taken to prevent the freezing of water pipes, and perishable fruit was ordered removed from the depots. It is estimated that about \$50,000 worth of property was saved by the warnings this year.

Montgomery, Ala.—The cold-wave service is really one of the most important features of the Weather Bureau work in this section. The warnings are widely distributed by mail, telegraph, and telephone. The warnings of February 6 and March 1 were especially beneficial to the early truck planters of this vicinity; also to shippers of perishable goods likely to be damaged by cold, who watch our reports and warnings closely. It is estimated that these warnings saved \$45,000 to the truckers of this section, and it is safe to say that the money value of these warnings to other interests in the past year is \$25,000. The river warnings are also of great benefit to the river commerce and lumber interests. It is difficult to form an estimate of the money value of these warnings to the

various interests, but it is safe to say that during the past year it would aggregate \$300,000.

Harrisburg, Pa.—It is estimated that the railroad companies alone saved in the vicinity of half a million of dollars by timely warnings of storms and cold waves. I never saw so much interest manifested by railroad officials before in the weather reports as at present.

Columbus, Ohio.—The warnings were very timely and gave unusual satisfaction, especially so during the severe cold waves in February. The expression from the different classes was one of great satisfaction with the promptness and benefits derived. During cold-wave periods, besides the publication, the warnings were telephoned to sixty individuals, railroads, and shipping houses in this city. It is difficult to estimate the amount of property saved by this means, but several hundred thousand dollars would be a low estimate. Over 50 car loads of perishable produce were held in safe places on several occasions during the severe winter weather. The ice and coal men conducted their business to greater advantage than ever before, and were greatly benefited. The breweries shipped all bottled goods on daily advices from this office and expressed their great satisfaction with the service.

Buffalo, N. Y.—October 5, large fleet of vessels detained by storm, ample warning having been given on the 4th. At least one million dollars' worth of property represented. The steam barge *Arnold* with two barges and the steam barge *Rhoda Stewart* with one barge cleared in early morning against the advice of the local forecast official and were compelled to return. November 2, warning given to-day was a marked success; wind reached a maximum velocity of 59 miles an hour from the southwest. Navigation entirely suspended. The warning was worth a million of dollars. Special request from Port Colborne, Canada, and other places for information as to duration of storm.

Chicago, Ill.—During the severe storm which swept the Lake region September 22-24, 1894, and for which storm signals were hoisted well in advance, the observers and the displaymen at the different ports, in answer to telegraphic instructions from this office, reported that 250 vessels were held in port as a result of the storm warning.

The Chicago Journal of September 12, 1894, editorially says:

"Several hundred cranberry farmers of Wisconsin were warned nearly twenty-four hours in advance by the Chicago bureau that a frost was to occur in that locality last Monday night. This gave them ample time to flood the marshes and prevent the freeze which otherwise would have ruined their crop. The bureau is keeping a close lookout for the coming of the first frost in the cranberry section, and the perfect manner in which it was forecast and the news circulated is sufficient evidence that the bureau is efficient. The correct forecasting of Monday night's frost and the large saving of property thereby are facts worth remembering. The press and public are always swift enough to censure the Weather Bureau when its forecasts go wrong. It is but simple justice that it be complimented when it so deserves."

St. Louis, Mo.—The following specific cases of benefits by forecasts may be cited: During the protracted cold weather from January 23 to February 15, 1895, 200,000 tons of ice, valued at \$150,000, were cut and housed according to the forecasts issued from this office each day. To properly appreciate the great importance of these particular forecasts to the ice interests, it is only necessary to state that the loss of a single day's work, due to an incorrect forecast, would have resulted in a loss of \$2,000 to one ice company alone, and it is a pleasure to state that no such loss occurred. This office was besieged each day before 9 a. m. by fruit and produce shippers anxiously inquiring whether or not they could ship on that day, and the advice in all cases was followed in confidence. One firm estimates its actual gain in money from these particular forecasts at over \$1,000, and a saving in perishable stock of about \$10,000. On this basis the saving to the fruit and produce men alone during the season of cold weather probably amounted to not less than \$300,000.

Charlotte, N. C.—It is estimated that fully \$100,000 were saved to the people of this section by the displays during the past winter. A notable instance of the benefit of these displays was on February 8, when the temperature reached the lowest point ever recorded for February. A warning of this expected severe weather was received, the cold-wave signal displayed, and notices telegraphed to fifty-five points in the State nearly twenty-four hours in advance, thus giving all interests ample time to make preparations to meet the severe weather predicted.

Dodge City, Kans.—The Weather Bureau work is better appreciated at this place than at any station I have ever before served. The warnings have saved a

number of human lives. Two lives were saved beyond a doubt February 3 last. Two men started out to drive to a point 30 miles south of here. Shortly after the severe cold-wave warning was received, the editor of a weekly newspaper sent after them and they came back to this city. They could not have lived through the storm and there was no shelter on the route they had taken. This city is surrounded by vast prairies on all sides and it is seldom any one ventures to drive very far out on them during the winter months without first consulting this office.

Charleston, S. C.—Much good was accomplished by the Bureau in predicting the severe storms of September 26–27, 1894. Property to the value of \$1,500,000 was saved in this locality through the timely warnings given. Upon the announcement of the storms mentioned there were seventy-six vessels of all classes detained in port. A careful estimate obtained from all available and obtainable sources of the money value of the property saved to the community by cold-wave warnings, during the past cold-wave season, amounts to \$425,000. Of this amount over \$110,000 was saved alone by the announcement of the cold wave of February 8, 1895. The frost warnings resulted in a saving of about \$180,000 to the truck gardeners, florists, and private gardeners. The river service in this center has been the means of saving upward of \$110,000 to the rice planters, farmers, stock breeders, lumbermen, raftsmen, and steamboat men, along the Edisto, Santee, Congaree, Wateree, Great Peedee, Black, Little Peedee, Lumber, and Waccamaw rivers, since October of this fiscal year.

The estimated value of property saved by the warnings of cold waves alone was \$2,275,000. It is reasonable to suppose that this amount, large as it is, does not represent 10 per cent of the value of property actually saved throughout the whole country. Probably \$10,000,000 would be a conservative estimate of the value of these warnings.

A marked instance of the value of the forecasts and storm warnings issued by the Bureau occurred in connection with the tropical hurricanes of September 24–29 and October 8–10, 1894, which passed northeastward along our Atlantic coast. The reports showed that during these two storms 10,305 vessels, valued at \$36,283,000, exclusive of the cargoes, remained in port throughout the period for which the warnings were issued. It is probable that a large proportion of these vessels would have gone out but for the warnings, and it is fair to assume that, had they done so, nearly all of them would have encountered the storms and been more or less damaged, if not entirely lost, as the records, so far as obtained of those vessels which went out in face of the warning, show that in nearly every case they suffered severe injury or were destroyed. In many instances the owners plainly state that, but for the warnings, their vessels and cargoes would have been total losses.

WIND-SIGNAL DISPLAY STATIONS.

The value of the service rendered to the public by the display of the wind signals has been very marked during the past year, and the recognition of that value is evidenced by the increased demand for the establishment of wind-signal display stations at the smaller harbors on the coast and Great Lakes. Thirty-one of these stations were established during the past year and at very slight additional expense, as in all but seven instances the displaymen agreed to serve without compensation in order to get the service, the Bureau simply furnishing the equipments and sending the warnings.

There are few harbors of any importance in the country now where wind signals are not displayed.

LOCAL WIND SIGNALS.

At the suggestion of the lumber shipping interests on the Gulf coast, the observers at Pensacola and Mobile have been authorized to hoist a signal, called the "local wind signal," whenever winds are indicated that are liable to cause injury to those interests. Instances have already occurred where the signal has proven of marked value.

HURRICANE SIGNALS.

Arrangements have been perfected during the year for a more thorough and effective distribution of the warnings of tropical hurricanes and other severe storms.

A new signal called the "hurricane signal" has been added, and the cooperation of the Customs Service, the Life-Saving Service, the Lighthouse Service, and the Revenue-Cutter Service, in the dissemination of the warnings, has been secured.

Many life-saving stations and custom-houses and the vessels of the Revenue-Cutter and Lighthouse Services and several steamship lines have been furnished with hurricane flags to be displayed when warnings are received, and arrangements have been made to give warning to the islands and coasts of the South Atlantic and Gulf by means of tugs and other steam vessels, which will display the flags by day, and send up rockets by night, blowing whistles to attract attention to the same.

TROPICAL HURRICANE REPORTING STATIONS.

Daily observations were taken from July 15 to October 15, 1894, at Kingston, Santiago de Cuba, and St. Thomas, by paid observers of the Weather Bureau, and telegraphic reports of the occurrence of hurricanes forwarded, which were of great value. These stations will be continued during the coming season, and arrangements have been made whereby the Bureau will receive similar reports from Merida, Yucatan. The Bureau also has an arrangement with the Meteorological Service of the Antilles and the Meteorological Department of Belen College, Habana, whereby those institutions forward by telegraph to this office any reports of threatening conditions received from their correspondents, located in nearly all the West India Islands.

LAKE MARINE SERVICE.

The work of this service during the past year resulted in the collection of important data relative to the currents of the Great Lakes, and wrecks and casualties to vessels occasioned by storms and unfavorable weather conditions, and a current chart and a wreck chart containing an orderly arrangement of these data were issued. During the season of 1894, daily meteorological observations were taken under the direction of this service by a large number of vessel masters on the Lakes, but at the beginning of the season of 1895, the collection of these data having been taken up by the Hydrographic Office of the Navy Department, its collection by this Bureau was, by the direction of the Secretary of Agriculture, discontinued.

A pamphlet entitled Circular of Information Relating to the Display of Wind Signals on the Great Lakes, containing a description of the different signals, a list of the regular and special display sta-

tions, and of the places where storm-warning messages are posted, has been prepared in the Forecast Division, and 5,000 copies of it have been published for distribution to the lake marine.

The professors and forecast officials on duty at this office have, as a rule, continued the work of making practice forecasts from the a. m. charts, and those on duty in this division, when not otherwise engaged, have been employed in the preparation of reports on subjects bearing on practical forecasting. Among the papers of this kind completed during the past year were reports on Types of Storms in the United States for each month in the year.

During the months of November and December, 1894, and January, February, and March, 1895, six officials of the Bureau were given a two months' course of instruction in the preparation of charts and the making of practice forecasts.

STATION WEATHER MAPS.

Three million one hundred and forty-eight thousand eight hundred and ninety-five weather maps, at 74 stations, were issued during the year, being an increase of 241,115 in the number of maps and 2 in the number of issuing stations as compared with the year ended June 30, 1894. On June 30, 1894, 8,139 maps were issued; on June 30, 1895, the issue had increased to 10,680 daily weather maps. The quality of these maps as to appearance and accuracy has been well maintained and there has been an increased appreciation of and demand for them on the part of the public generally.

At the larger stations the number of maps that can be printed at a single issue by the present method has nearly reached its limit, and effort is being made to devise a means of printing a larger edition.

The expense of lithographing the weather map, as is done at Washington, is too great to be allowed at other stations. The present milliographic method is not entirely satisfactory. Experiments are now being made with the view of devising a more economical method—one that will insure a more legible print and more lucidly present the weather conditions to the public.

RIVER AND FLOOD SERVICE.

The river service consisted on June 30, 1895, of 37 river centers and 147 special river stations. Forty-seven special rainfall stations may be considered as tributary to the river work, and will be included in this review of the year. The duty of warning communities when their interests are affected by floods falls naturally upon this Bureau, and in various appropriations, under the subhead "River and Flood Observations," the work has been recognized and provided for.

The duty of forecasting floods and dangerous river conditions is intrusted to the local forecast officials at the principal river centers.

New stations have been established during the year as follows: Bluff City, Tenn.; Speers Ferry, Va.; Radford, Va.; and Stoyestown, Pa., in the East, and Wenatchee, Wash.; Lewiston, Idaho; Weiser, Idaho; and Newport, Wash., on the Columbia and Snake rivers. An effort was made during the year to improve the river service along the Ohio, so that shippers of coal from Pittsburg to lower points on the Ohio and Mississippi might have fuller knowledge of the stages of the water in the lower Ohio. The towing fleets must be in readi-

ness for what is known in the parlance of the trade as barge or coal stages. For this purpose the amount of rainfall at the headwaters of the rivers tributary to the Ohio is of much importance.

An interesting experiment has been made during the year in the distribution of river information to river men by means of a large bulletin carried on one of the Mississippi steamboats. To W. T. Blythe, local forecast official at Cairo, Ill., belongs the credit of suggesting and devising this plan.

Each observer in charge of a river center was called upon for a short paper upon the regimen of the rivers under his care, giving all matters of interest connected with the watershed and rainfall of the vicinity, and such notes concerning his own experience in forecasting river changes as he might be able to give. From all these reports a large and, it is thought, valuable compendium of our knowledge of floods has been prepared and submitted for publication.

During the past winter unusual freezing of the rivers occurred, and in one or two instances not less than 2,000 miles of river were frozen. All the ice passed out with very little damage.

TELEGRAPH SERVICE.

The service rendered the Bureau by telegraph companies during the year was prompt and efficient. By readjustment of the rates for local forecasts and cotton-region messages a saving of about \$4,000 was effected. During the year six hundred and thirty-six accounts were audited.

In addition to telegraphing the regular weather reports, wind-signal orders, and forecast messages, full a. m. and p. m. forecasts were telegraphed direct from this office to the Baltimore, Philadelphia, and New York offices of the United Press and Associated Press, which in turn distributed them to all parts of the United States, excepting the Pacific Slope States.

Of the 515 miles of seacoast lines reported in operation at the close of the year ended June 30, 1894, 30 miles were discontinued by the sale, on August 31, 1894, of the line from Wilmington to Southport, N. C. The remaining 485 miles consist of three sections on the Atlantic coast, aggregating 282 miles; three Pacific coast sections, aggregating 166 miles; and a section of 31 miles on Lake Huron.

The Hatteras section (161 miles) remained in efficient working order throughout the year, with the exception of seven times when communication was interrupted for twenty-four consecutive hours. No extensive repairs were necessary, beyond the furnishing of 158 poles to replace those destroyed by lightning or rendered unserviceable from natural decay. Besides supplying the usual weather and vessel reports, this section proved of value in several instances in calling assistance to vessels in distress.

On the Nantucket section (98 miles) the number of whole days on which communication was interrupted amounted to twenty-two. Owing to the construction of trolley lines at Marthas Vineyard it becomes necessary to provide against damage to the submarine cables from high voltage currents, and arrangements have been made with the Southern Massachusetts Telephone Company by which the telegraph line will be moved out of danger whenever it is paralleled by trolley wires. One hundred and twenty-five new poles and 100 cross-arms are reported as needed on this section during the present year.

The Block Island section (29 miles) remained in excellent condition and suffered no interruption whatever during the year.

On the Pacific coast and Tatoosh Island section (80 miles) communication was interrupted during twenty-four days, a decided improvement over the record of former years, mainly due to the establishment of two additional repair stations in the fall of 1893. Beyond moving 7 miles of line and clearing the trail of the Gettysburg section, no general repairs were necessary during the year.

The Fort Canby section (28 miles) worked satisfactorily, with a total interruption of but twenty-two whole days, fifteen of which were due to the failure of the cable across Youngs River, which had to be replaced with 1,600 feet of the spare cable stored at Fort Stevens. General repairs were made during October and November, and additional work will become necessary during the present summer, at an estimated cost of \$101.50.

The line from Point Reyes Light to San Francisco (58 miles) has not been maintained with that degree of efficiency which has characterized other and more difficult sections; although, from the fact that commercial lines could be utilized for part of the way, the number of actual interruptions was reduced to thirty-nine whole days. The lack of promptness on the part of the repairman was, in a large measure, responsible for this unsatisfactory showing. He has been ordered discharged, and steps have been taken to transfer a portion of the wire to Western Union poles, where it can be more readily observed and repaired when in trouble. Since May last the Point Reyes office has been in telephonic connection with the life-saving station, distant about 4 miles, and the connection has already proved of value in rendering aid to vessels in distress. The need of an office building for the observer at Point Reyes Light has been referred to in former reports.

The lines and cables from Alpena, Mich., to Thunder Bay and Middle Islands, Lake Huron, continued in excellent working condition, the number of whole days on which communication was interrupted amounting to but four days on the Thunder Bay section and none whatever on the Middle Island line. Aside from the main purpose served by these lines (the display of wind signals on the islands), they have proved useful on several occasions in summoning aid to vessels in distress. Telephones are used in transmitting messages to and from the displaymen.

Although no specially striking instances were noted during the past year, the value of the seacoast telegraph lines to maritime and other interests—in communicating with and reporting passing vessels, summoning aid in cases of disaster, securing the display of storm warnings at dangerous and isolated points, furnishing important meteorological reports not otherwise obtainable, aiding the work of the Life-Saving and Customs services, and incidentally affording telegraphic facilities to citizens and visitors at isolated localities—is too well known to require more than a brief reference in this report.

The total United States receipts from commercial messages transmitted over the seacoast lines during the year were \$4,450.90; and in addition, \$4,560.39 was collected on account of connecting commercial lines.

STATE WEATHER SERVICE.

The supervision of forty-one State weather service organizations and of the cotton, sugar, and rice services constitutes the work of this division. Through the first named the Bureau collects monthly meteorological reports from more than 3,000 voluntary observers, weather crop reports from about 9,000 special correspondents, and distributes the daily weather forecasts and special warnings to some 20,000 places.

By the cotton, sugar, and rice region services, daily telegraphic reports of temperature extremes and rainfall from 127 stations, grouped under 12 district centers, are collected and published at each district center and at certain other Weather Bureau stations. The cotton, sugar, and rice region reports also afford a large part of the meteorological data used in the preparation of the National Weather Crop Bulletin, supplying reports from 127 stations in the Southern States.

Independent of the great utility of a State weather service in the collection and publication of weather crop information, and the distribution of weather forecasts and special warnings, it would be difficult to overestimate the value of such organizations in other directions. At the Brooklyn convention of the American Association of State Weather Services, held August 17, 1894, the director of the New Jersey Weather Service stated that, had the New Jersey Weather Service been prepared five or six years ago to give the data now in its possession, the city of Newark would have saved hundreds of thousands of dollars in its public works. Numerous communications on file at this office might be quoted as showing the great value of the data being collected and published in convenient form for investigation and future reference. During last winter's session of the New York legislature, when the bill for the support of the State Meteorological Bureau was being considered, there was some opposition to the measure. As a result of this opposition there came from all parts of the State the most urgent appeals in behalf of the local weather service, and the bill providing for its support was promptly passed. Among many other communications from prominent officials in the State, the following are given as representing the appreciation of the State Weather Service in that State:

BUFFALO, N. Y., *February 23, 1895.*

To Hon. Senator HIGGINS,
Capitol, Albany, N. Y.:

I am quite familiar with the work done by the weather bureau of the State of New York, and as a civil engineer beg to state that I appreciate its value.

To-day the question of water, storage, sewers, waterworks, relations of climate to health, plant life, etc., depend upon the rainfall, temperature, and evaporation.

We are designing stupendous and costly works to-day, knowing the relation with rainfall and stream flow, the deliveries of areas in their streams, etc. All this information was furnished accurately in a reliable manner by the weather bureau of the State of New York, and practical men have begun to depend upon this information.

(Signed)

T. GUILFORD SMITH,
*Chairman Regents Standing Committee on State Museums,
University of the State of New York.*

OFFICE SYRACUSE WATER BOARD,
Syracuse, N. Y., February 8, 1895.

To DIRECTOR, etc.,
Ithaca, N. Y.:

DEAR SIR: I have among my papers a complete set of the monthly reports of your Bureau. These I appreciate very highly and consider them the most complete reports of this character that have come under my notice. I consider them almost invaluable in determining the best available source of water supply for a city or village. The capacity of a watershed in any particular locality can best be determined by the aid of your reports.

Without these, two very grave mistakes might be made in the construction of waterworks. In one case they might expend a large amount of money in the construction of a plant, and later find that they are without water for the reason that their reservoir is of insufficient capacity. On the other hand large sums of money might unnecessarily be spent in the construction of reservoirs beyond the requirements.

There are many urgent needs for your reports other than to aid hydraulic engineers. A report over a long period is most valuable, and it would be a great loss to discontinue a good work.

In my opinion every city and village should take a great interest in this matter.

(Signed)

W. R. HILL,
Chief Engineer and Superintendent.

In Iowa, Maryland, Michigan, Nebraska, New Jersey, New Mexico, New York, North Dakota, Ohio, Oregon, and Pennsylvania, State weather services have been supported by legislative enactments. It is regretted, however, that the bill providing for continued support of the Pennsylvania service, which the legislature recently passed, was vetoed by the governor. The State that fails to provide means for publishing its climatic advantages, and obtaining the other benefits to be derived from the Weather Bureau, neglects an important duty, and those Commonwealths that have recognized the value of the State weather service, and made provision for its support, are already receiving returns which more than repay the outlay, which is generally small. Much can be accomplished with an appropriation of \$1,000 per annum, and in some instances very valuable work has been done with a considerably less sum. The State weather services of California, Indiana, Kansas, Missouri, Nebraska, North Carolina, and Virginia, and the New England weather service have received aid from State and other institutions for printing monthly reports in creditable form, but the legislatures in these States as yet have made no provision for the support of their local weather services. In a number of States the State weather services receive no assistance other than that extended by the Weather Bureau, but through zealous and energetic work on the part of the Weather Bureau officials, some excellent reports are being issued as private publications, the expense of issue being borne by funds derived from the insertion of a limited number of advertisements. In Illinois, Louisiana, Minnesota, and Wisconsin, highly creditable publications are issued by the means referred to, and it is expected that other services will adopt this plan during the ensuing year.

THE DISTRIBUTION OF FORECASTS, AND OF FROST, COLD-WAVE, INLAND
STORM, RAIN, AND EMERGENCY WARNINGS.

While all lines of State weather service work have been greatly extended during the fiscal year ended June 30, 1895, the most important has been in connection with the distribution of weather forecasts and special warnings. For years the distribution of weather

forecasts has been a most important question with the Bureau. To reach all classes with this information in time to make it of practical value in the government of their daily transactions has been a difficult problem. When it is considered that the forecasts are true at least eight times out of ten, the great advantage of having such information from twenty-four to thirty-six hours in advance is so apparent as to need no argument to prove its value. It is the agriculturist to whom it has been most difficult in former years to give the benefit of this information, but a great deal has been accomplished in the past year in placing the forecasts at the disposal of the farmer. At no time during the existence of the Weather Bureau has the system of distributing the daily weather forecasts and special warnings been so complete and satisfactory as at present, and no system that has ever been tried for the dissemination of this important information has proved so economical and effective as the logotype plan, which was put into operation during the latter part of the preceding year. By this plan alone the number of places receiving the weather forecasts has been increased by more than 7,000 at a nominal expense, not exceeding 25 cents per year for each place supplied, and this trifling cost per station will be lessened during the coming year by the reduced cost of the supplies furnished under contracts for the year 1895-'96; and, with the extensive preparations now in hand, in a comparatively short time no important community in the United States will be without the daily predictions of coming weather changes. In the dissemination of weather forecasts, the Bureau has received the voluntary aid of public-spirited citizens, especially postmasters, throughout the country. Through the hearty aid of the latter, and the special advantages they have for convenient and rapid communication with adjacent communities, it has been possible to give widespread publicity to the weather forecasts, cold-wave, frost, and emergency warnings issued by the Bureau.

An addition of 142 in the number of places receiving forecasts and special warnings by telegraph or telephone, at Government expense, has been made, but a large proportion of this number are centers of distribution, from which the information is mailed daily to five or more suboffices, the remainder being forecast display stations at which flags are displayed or whistles sounded, indicating the forecasts, for the benefit of the general public.

In May, 1895, the Secretary of Agriculture called the attention of the Honorable the Postmaster-General to the value of cooperation on the part of postmasters in the distribution of weather forecasts, and he readily approved and acted upon the suggestion made by the Secretary of Agriculture that postmasters throughout the country be requested to render the Weather Bureau assistance in its efforts to give the public the best possible service in the dissemination of weather forecasts. Accordingly, in the Official Postal Guide of June, 1895, was published a letter from the Postmaster-General inviting postmasters to take interest in and cooperate in the work of giving the public of their respective communities the advantage of the weather predictions. As a result of the publication of this letter many offers from postmasters to assist in the work have been received, and during the coming year this work will be greatly extended. At the close of the year for which this report is made, over 22,500 places were receiving the daily forecasts and special warnings of the Bureau, this number being over 100 per cent

While the Bureau has for a number of years felt the necessity for a special system by which warnings of exceptional weather conditions, such as tropical hurricanes, cold waves, and storms of unusual severity, might be given out, it was not until the early part of the fiscal year to which this report applies that a plan was carried into effect by which the Bureau could distribute by telegraph what have been designated "emergency warnings." Arrangements have been made by which about 3,500 towns, in addition to the regular forecast display stations, now receive emergency warnings. When the weather conditions are such as to justify the issue of emergency warnings, the messages to the telegraphic distributing centers terminate with the words "notify postmasters," to indicate the urgent character of the information, and to distinguish the message from that containing the ordinary forecasts.

On February 17, 1895, the logotype system of forecast distribution was inaugurated in this division for the benefit of local interests and the agricultural and other interests of the States of Maryland, Virginia, and West Virginia, at such points as could be reached with the cards before 6 p. m., and at the present time over 600 addresses are being supplied daily (except Sunday) with the a. m. forecasts by this division. By means of a special messenger service the cards are delivered to the outgoing trains at both railroad stations, so that the a. m. forecasts are furnished to postoffices in southern and western Virginia and eastern West Virginia early in the afternoon of the day of issue.

The distribution of forecasts over railroad wires without expense to this Bureau has also been extended, an increase of 292 places being noted over the number of stations recorded one year ago.

There has been a slight falling off in the number of stations receiving weather information by railroad train service, this means of disseminating forecasts not being as popular, as it is attended by enforced cooperation on the part of railroad employees, who do not give the work the required attention to make this mode of distribution a success. On some roads, however, notably the Old Colony of New England, the railroad train service, as a means of forecast distribution, is a marked feature, and the officials of the roads exact from their employees a strict compliance with instructions regarding the prompt and proper handling of the bulletins.

COTTON-REGION SERVICE.

The cotton-region service has been continued and the interests for which this system of observations and reports was inaugurated have been well served. The good effects of inspection of these stations, which was made during the preceding year, have been apparent in the general improvement in character of work on the part of observers. Especial efforts have been made to improve this branch of the service since it was put in charge of the State Weather Service Division, and that efforts in that direction have been successful is indicated by the following resolution adopted by the board of directors of the Montgomery, Ala., Commercial and Industrial Association at its meeting held December 3, 1894:

Resolved, That the directors of the Commercial and Industrial Association hereby tender their thanks to Mr. F. P. Chaffee, chief of the United States

Local Weather Bureau, at Montgomery, for the valuable services he has rendered this association in furnishing it with daily reports of the weather, temperature, and rainfall in the cotton belt during the season just closing. This important information is greatly appreciated, not only by our immediate community, but by our people throughout the State.

We trust the Federal Government will maintain *or increase* the appropriation made for the continuation of this valuable branch of the Government service in this section.

As further evidence of the value of the cotton-region service may be quoted the following communication of November 22, 1894, addressed to Mr. F. P. Chaffee, Weather Bureau official in charge of the Montgomery cotton-region center, and signed by Lehman, Durr & Co., cotton factors, and twelve other prominent cotton factors and firms directly interested in the cotton crop:

We, the undersigned cotton factors and brokers of Montgomery, desire to acknowledge to you, and through you to the Chief of the Weather Bureau at Washington, our high appreciation of the great benefit and aid the Weather Bureau reports of temperature and rainfall in the cotton belt during the season just closing have been to the cotton industry of this section, and the very courteous, thorough, and business-like manner in which such reports have always been furnished the public by yourself and the competent and courteous assistants in your employ, and beg that you will use your kind offices in influencing such appropriation as will insure ample funds for this valuable branch of the Government service in this section.

Provision was made in the appropriation for the fiscal year 1895-'96 for the establishment of 10 additional stations. All necessary arrangements were made for opening these stations on July 1, 1895, and in selecting points at which the observations were to be made, the interests to be served were carefully weighed and the stations located at the most eligible points having proper telegraphic facilities. These 10 additional stations make a total of 127 places in the cotton, sugar, and rice regions of the South, from which daily observations of temperature and rainfall are telegraphed to district centers and published in bulletin form.

SNOW AND ICE CHARTS.

The snow and ice charts published during the winter of 1892-'93 were resumed during the winter of 1894-'95. This publication, which is issued weekly, on Tuesdays, shows the depth of snow on the ground at 8 p. m. on Monday, and the thickness of ice in rivers and harbors. Many manufacturers and wholesale dealers in rubber goods or in fabrics suited to the rigors of winter, now closely consult these charts, so that they may send their agents or ship their goods advantageously into the district north of the snow line.

STATE WEATHER SERVICE CONVENTION.

The American Association of State Weather Services, which was organized at Rochester, N. Y., in 1892, for the purpose of advancing the work of the Weather Bureau on State weather service lines, held its third annual convention in Brooklyn, in conjunction with the American Association for the Advancement of Science, which met in that city August 15-24, 1894. The meeting, while not so largely attended as some of the previous conventions, was a very successful one. A report of its proceedings was published as Bulletin No. 14 of the Weather Bureau, U. S. Department of Agriculture, and 12,000 copies

were printed and distributed to the voluntary observers and weather crop correspondents of the Bureau. Much good has resulted from these State weather service conventions, at which the various methods of work in the several States are fully discussed and views exchanged as to the most desirable and effective means of increasing the value of the Weather Bureau to people throughout the country. The fourth annual convention of this association, to be held at Indianapolis, Ind., October 16-17, 1895, promises to be the largest held since the organization of the association.

WEATHER CROP BULLETINS.

The weather crop feature of State weather service work has continued most popular and useful. The excellent system under which this work is now operated is the result of practical experience of a number of years, and it is doubtful whether it can be further improved with present facilities. The circulation of both national and local bulletins has grown steadily during the year, and it would be difficult to overestimate the extent to which the information they contain is published through the press of the country. At the close of the year, of the forty-one services publishing weather crop bulletins, all but six issue their bulletins in printed form, which is a marked improvement over the work of previous years, when most of the bulletins were issued by milliograph process.

VOLUNTARY METEOROLOGICAL STATIONS.

During the year 410 voluntary meteorological stations were established, the total number of such stations now in existence being somewhat over 3,100. The rapid increase in the number of these voluntary meteorological stations in recent years leaves but few counties in the entire country without a record of temperature and rainfall observations made with instruments of standard pattern.

METEOROLOGICAL RECORDS AND DATA.

The Division of Records and Meteorological Data has for its purpose the care and preservation of the meteorological records of the Bureau, the examination of the observational work of station employees, and the preparation of statistical matter for the use of the public officials of the Bureau, and also for publication in the MONTHLY WEATHER REVIEW.

Nearly 300,000 meteorological reports of one form or another, including the daily and weekly instrumental register sheets, are received in this division annually. From this vast collection of material charts and tables appropriate to subjects of special inquiry are made, and the data are systematically arranged for reference and publication.

The records of meteorological observations made by the station force are carefully examined in this division, since it is quite necessary that any tendency to careless and inaccurate work should be quickly corrected.

In addition to the meteorological reports of Weather Bureau observers, about 2,400 voluntary observers make monthly returns to the various State centers, and through the latter to the central office. The climatological data furnished by the voluntary observer supple-

ment to a very great extent the information contained in the reports of regular Weather Bureau stations, particularly as to rainfall and temperature, the two climatic elements of the greatest importance to all conditions of life.

It affords me very great pleasure to acknowledge the fidelity and public spiritedness of these observers.

The statistics of temperature and rainfall extending back to the beginning of meteorological observations in the United States, compiled in the division above named, if well distributed, would be of no inconsiderable value to the people of the United States. It is proposed, therefore, to copy from time to time and send to the directors of the various State services so much of the compilations of this division as will aid them in their current work, and also enable them to supply the public with information heretofore obtainable only by application to the central office.

The meteorological observations made by the Signal Service and Weather Bureau now cover a period of twenty-five years. The facts accumulated by these observations constantly find application in the development of new industries and in the growth and expansion of diversified interests. The central office, as well as the numerous outlying stations, has kept apace with the demand for information of a statistical nature, and at times, when very great interests were involved, considerable time has been devoted to compiling the necessary data. Free use of our data may be had at all times, subject to such restrictions only as may be necessary to preserve the integrity of the records.

PROPERTY.

During the past year this division has, by direction of the Secretary of Agriculture, made a full and complete inventory of all property in the central office and at stations, together with an itemized statement of all purchases, receipts, and shipments from July 1, 1894, to February 1, 1895.

Since July 1, 1895, more accurate and expeditious methods of handling Government property and receipting for and recording its transfer from the central office to stations have been introduced. Under present regulations each item of a shipment must be invoiced within three days after the shipment, so that a prompt comparison may be made at stations between the invoice and the property received, receipt at once returned, if the property reaches its destination, and proper report made if it does not.

The business of the division is being handled in a satisfactory manner.

LIBRARY.

During the year 785 books and 381 pamphlets were added to the library, making a total in the library at this date of 15,896 books and 5,741 pamphlets. Of the 785 books added, 262 were purchased, while 523 were received as gifts or in exchange for publications of the Bureau. Of 381 pamphlets added, 81 were purchased and 300 were secured by gift and exchange.

An allowance of \$1,000 was set aside from the contingent fund for the purchase of books for the fiscal year. Of this amount the sum of \$650 was expended. For the year 1895-'96 the sum of \$1,500 has been allowed.

The present force consists of a librarian and one assistant.

PACIFIC COAST SERVICE.

Two able forecasters are stationed on the Pacific coast, one at Portland and the other at San Francisco. The Portland forecast district comprises the States of Washington, Oregon, and Idaho; the San Francisco district, the States of California, Nevada, and the Territories of Arizona and Utah.

In August, 1894, the San Francisco official was promoted from local forecast official to the grade of forecast official, in consideration of having won second place in the competitive examination inaugurated a few months before for the purpose of selecting an official to fill a vacant professorship.

The weather conditions on the immediate Pacific coast are purely marine. In the plateau regions of the Rocky Mountains they are continental in character. Both conditions are quite distinct from the storm conditions of the country farther east. It has been found advisable to organize forecast districts separate from those east of the Rocky Mountains. While these regions are not often visited by such terrific storms as prevail east of the Rocky Mountains, there is still a fruitful field for the forecaster. Grazing interests are greatly dependent upon the rain warnings. Ranchmen move their flocks and herds as they learn that rain has fallen in other sections. In the fall, at the time of first rain, the information is of very great value. In the spring, after rain ceases, the grass cures on the ground, and still remains good feed for stock; but the first rain in fall rots the grass, and unless rain then falls at frequent intervals the stock is in danger of starvation; therefore, when information is received that rain is about to occur, or has occurred, owners of ranches who live in San Francisco, or other cities, arrange to ship the necessary hay and fodder to keep the stock until the new crop of grass has grown sufficiently to maintain them.

The morning weather map is now issued at San Francisco at 8.30 a. m., instead of at 11 a. m., as was the case before the present official took charge, thus making it available for use at the opening of business hours.

PUBLICATIONS.

The work in this division has steadily increased, as shown by the following statement:

No. of impressions on printing presses for the fiscal year ended June 30, 1895	2, 959, 914
Previous year	1, 840, 305
Increase	1, 119, 609
No. of impressions on lithograph presses for the fiscal year ended June 30, 1895	1, 887, 205
Previous year	1, 024, 238
Increase	862, 967

The work in the drafting room, folding room, forms room, and mailing room of this division has also materially increased. The work is generally well executed mechanically.

OBSERVATION STATIONS.

On June 30, 1895, there were in operation 157 regular paid stations of the Bureau, at which observations are taken or work of State weather services performed, against 156 the year before. There have been discontinued: Southport, N. C.; Colorado Springs, Colo.; Pikes Peak, Colo.; and Tucson, Ariz. There have been established: San Luis Obispo, Cal.; Independence, Cal.; Phoenix, Ariz.; Lincoln, Nebr.; and Lansing, Mich.

Forty-eight stations were inspected.

INSTRUMENTS.

The work of the Instrument Room pertains to the maintenance of the instrumental equipment of stations installed for the purpose of securing meteorological observations. This includes the preparation of complete drawings and detailed specifications required for the purchase of instrumental supplies, accessories, etc.; the inspection, test, and adjustment of all new instruments; their issue to stations; the supervision by correspondence of their erection, exposure, and operation while on stations; and the monthly inspection of all automatic records, comparative readings, etc., for the purpose of detecting neglect or improper care, or the defective performance of instruments.

The following table exhibits the number of the more important instruments received and issued during the year ended June 30, 1895:

Name of instrument.	Acquired by purchase.	Received from stations.	Issued to stations.
Anemometers	*100	94	83
Barographs	5	16	13
Barometers, aneroid	2	8	7
Barometers, mercurial	*75	51	56
Gauges, weighing rain and snow	3	6	6
Gauges, rain recording		6	2
Machines, map circling	41		38
Recorders, sunshine	20	11	10
Registers, single	*23	24	23
Registers, triple	4	16	15
Telethermographs		7	5
Thermographs	1	46	43
Thermometers, exposed	100	† 145	127
Thermometers, maximum	400	† 280	336
Thermometers, minimum	300	† 229	324
Thermometers, soil	25		† 34
Thermometers, water	50	† 24	17
Whirling apparatus		4	4
Wind vanes	5	3	7
Wind-vane supports, complete		2	12

* Repaired instruments.

† These amounts include 78 exposed, 227 maximum, 173 minimum, and 14 water thermometers, which were received broken and totally unserviceable.

‡ Turned over to Division of Agricultural Soils.

The forecasts of the Weather Bureau are much dependent upon the station instruments. A dozen bad barometers and thermometers in use at as many stations, giving erroneous measurements, might lead to an entire misrepresentation of existing meteorological conditions. It is plainly seen, therefore, that the purpose of the Instrument Room is, and should be, to preserve uniformly at all stations the greatest attainable accuracy in the observations from instruments,

not only as they relate to forecasts, but to all the great volume of data annually accumulated and published by the Bureau.

In the discharge of its duties during the past fiscal year the Instrument Room has prepared and mailed about 1,100 letters, and has inspected and examined 62,000 record sheets and forms from automatic instruments in operation at stations. In the aggregate, about 1,016 thermometers of all kinds have been compared with the standards, and correction cards furnished. Anemometers, barometers, and self-registering instruments frequently become impaired with ordinary station use, and are repaired, to a large extent, at the central office. As, however, the force and facilities available for doing this repair work are very limited (two small foot lathes, with bench tools, and two mechanics), some repairs must be done outside on contract, and the work in the machine shop is confined to that of the simplest character.

The subappropriation allotted for the purchase and repair of instruments for the fiscal year ended June 30, 1895, amounted to \$8,500. The aggregate expenditures from this amounted to \$8,440.37, leaving a balance of \$59.63.

The greater part of the instrumental supplies expended during the year was for the purpose of replacing the damaged, broken, or worn-out equipment of stations already in existence. A limited number of thermometer has been issued to new voluntary observers.

The official in charge of the Instrument Room was designated the agent representing the Weather Bureau at the Atlanta Exposition, and to him was assigned the important duty of making all the necessary preparations for the exhibit.

PLAN OF WORK FOR CURRENT YEAR.

The present chief took charge of the Bureau July 4, 1895, and at once undertook a careful review of its work, and a careful consideration of its scope and purposes, in the light fortunately afforded him by a long period of active service in the practical work of the Bureau. The close personal attention given to the administrative work of the Weather Bureau by the Secretary of Agriculture, with special reference to economy in expenditures and to efficiency in those lines of work having a practical bearing upon the needs of the public, fortunately marked out for the present Chief with unmistakable clearness certain lines in strict accordance with which he has undertaken the responsible duty of reorganizing, consolidating, and perfecting the administrative work of the Bureau in all its branches. As many steps in the work as thus mapped out have already been undertaken at this writing, it is unavoidable that this portion of the report, while designed to set forth the plans of work for the current year, should also serve to a certain extent as a report of work done during the first quarter of the present fiscal year.

REORGANIZATION.

The position left vacant by the promotion of a professor to be Chief was filled by the advancement of an official who had made the highest record in forecasting at Washington during the past year and he was assigned to duty at Chicago in charge of a large district. The vacancy caused by this promotion was filled by an official, who,

in a recent rigid competitive examination, gained the second place in forecasting, the one gaining first place having already been advanced.

Two chiefs of divisions were appointed, the positions being filled by the promotion of officials of long service whose sole recommendations were their abilities as officials and their integrity as men. Observers on station have similarly been promoted in deserving cases. A careful record is kept of all errors made by observers in taking and working out observations, and in making meteorological forms, of their failure to take observations on time, and other lapses from duty. This record, with the general reputation of each man, is the sole basis for promotion.

The policy of the Secretary of Agriculture in dispensing with superfluous officials, and filling all vacancies, even those outside the classified service, by the promotion of meritorious employees from the lower grades, has exercised a most salutary influence in every branch of the Bureau, and must greatly inure to the good of the public service.

The total number of observers and officials on stations outside of the city of Washington was—

On June 30, 1895.....	301
On September 30, 1895	289

Decrease in force	12
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The total number of messengers and laborers on stations outside of the city of Washington was—

On June 30, 1895.....	68
On September 30, 1895	70

Increase.....	2
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The total number of station employees promoted from July 1 to September 30, inclusive, including those to take effect on October 1, is..... 78

Reduction in per annum expense by the discharges, reductions, resignations, etc., which have been made in the station employees outside of the city of Washington from July 1 to September 30, inclusive \$17,485. 00

Increase in per annum expense by the promotions, appointments, and transfers which have been made in the station force outside of the city of Washington from July 1 to September 30, inclusive, and including promotions made to take effect October 1 16,416. 50

Being a reduction per annum in the expense for the payment of salaries to station employees of 1,068. 50

By cutting off unnecessary work and dispensing with the services of those inefficient or inattentive to duty, it has been possible to give a material advance in salary to seventy-eight meritorious workers, as shown by the foregoing statement, and still to diminish expenditures of the public funds at the rate of \$1,068.50 per annum.

The total number of employees in the office of the Chief of the Weather Bureau promoted from July 1 to September 30, inclusive, was 12.

The total number of employees in the office of the Chief of the Bureau on June 30 last was 170, with salaries aggregating per annum. \$183,950. 00

The total number of employees in the office of the Chief of the Weather Bureau on September 30 was 159, with salaries aggregating per annum 175,660. 00

Being a decrease of 11 employees and a saving per annum of 8,290. 00

Of this saving, however, \$6,840 is due to the separation from the Bureau of the Division of Soils, with its clerical force, which was provided for as an independent division in the Department of Agriculture on July 1, and the proper saving, therefore, to be credited to the Weather Bureau management since July 1 is. . . . \$1,450.00

An economical distribution of the work at this office has rendered it possible to promote twelve deserving employees without increasing the expense for salaries; in fact, there is a saving effected of \$1,450 per annum; and this, with the saving of \$1,068.50 effected on the salary roll of the station force, makes a total saving of \$2,518.50.

USELESS EXPENSE ELIMINATED.

Since July 1 the number of observers on stations has been considerably reduced. A thorough revision of all meteorological forms has been made during the past three months, simpler methods have been introduced, and unnecessary work has been discontinued. The saving thus accomplished is equivalent to the time of at least ten observers, and a consequent saving in expense of \$10,000 annually.

A careful redistribution of the working force on stations has been made. At some stations observers were on duty twelve to fourteen hours daily. These men cared for and collated the records of automatically working instruments, took the observations, and attended to the distribution of weather information for the benefit of their respective communities. At some places several men were found on duty where far less work was being performed than at some of the one-man stations. A redistribution of the force has been made, so as to equably adjust the duties, as far as possible, among the different stations. It is essential that the executive functions of the Bureau should be controlled by one familiar with the numerous details of the station work, and of the varying needs of the communities in different sections of the country. A thorough personal knowledge of these duties should be supplemented by frequent inspections by the Chief of the Bureau himself, so that he may keep closely in touch with the working force of the service, and be well informed as to the varying needs of the stations.

At fifty-eight stations the working up of the hourly temperature and pressure data was discontinued on September 1. Little or no use has ever been made of these data, and great volumes are now stored in the vaults of this office. Further accumulation is useless. It has required in the aggregate the time of four men annually to make these forms, and during the twenty-five years that the Bureau has existed probably \$100,000 has been spent on this work. These data have been continued at the twenty-eight stations from which the records are desired for use in the annual tabulated report of the Chief of the Weather Bureau, and these stations, being equidistantly placed throughout the United States, sufficiently preserve the record of the hourly temperature and pressure conditions of the country. At the fifty-eight stations where the working up of the data was discontinued the instruments are continued in operation, and the original record sheets are filed at the main office, so that the data may be worked up if at any time in the future it be found desirable to do so. This curtailment of work has therefore been accomplished without in any way impairing the efficiency of

the Bureau, or eliminating any portion of the work essential to the scientific investigation of meteorological problems.

A displayman was appointed during September, 1895, at one station, in place of the regular observer, and a more economical and equally efficient administration of the office secured; one station was opened and one abandoned, the result being a net saving of about \$1,000 per annum.

In August, 1895, a reorganization and redistribution was completed of the telegraphic reports of observations which are sent to the different Weather Bureau stations throughout the country for the purpose of issuing local weather maps and of enabling the officials in charge of stations to give proper information to the different industries in their vicinities. The stations from which reports were to be sent to given centers were selected so as to enable observers to have a clear and concise report of existing weather conditions throughout the country. At some stations too many reports were being received, and at others too few. In some instances the selection of stations from which telegraphic information was received showed bad judgment. As an illustration the case of the observer at Grand Haven may be cited. He was receiving many reports from remote points in the Rocky Mountain region, and from stations as far south as Atlanta and Vicksburg, while from many contiguous stations at lake ports, and from which mariners in his locality might need information, he received none. Effort has been made in rearranging the distribution of points of observation from which each Weather Bureau office shall receive its report, to adjust the situation so as to meet the various needs of each central office, that it may give to the people of its vicinity information really required, and so that this Department may at the same time dispense with all unnecessary reports and restrict the useless expenditure of public funds. This rearrangement of the telegraphic service will effect an annual saving of \$3,500.

Economy without detriment to the service has also been effected in the telegraphing of night observations to this office, confining them to such as are useful to the weather forecaster. In accordance with this policy the evening telegrams from 31 observation stations were discontinued to take effect September 30. The saving thus effected will result in an annual reduction of expenses of \$6,082, making a total saving possible on telegraphic expense during the coming year of \$9,582.

On September 30, 1895, the lithographing of the evening weather map was discontinued. The printing of this map was mainly for file. The mailing list was small, and is now supplied from the issue of the morning lithograph map. The public will not miss the evening chart. The files of this office do not require that it be printed, because the data which it contains are already worked up in an elaborate form on special charts constructed in a form better adapted for purposes of study and investigation than they possibly can be in the printed form. As a result the services of one lithographer and one printer have been dispensed with. The expenditure of money to do this work has never made adequate return, and its being continued for many years past can only be explained by a tendency to accumulate data which grew even to the length of duplicating those data, without sufficient regard to their practical use. This is a

heritage handed down from previous administrations. In the interest of economy and efficiency, and for the opening up of new lines of thought and investigation, it becomes necessary to discard precedents and to mark out the way anew, eliminating everything no longer needful and substituting whatever promises materially improved results.

DAILY FORECASTS TO AGRICULTURAL COMMUNITIES.

The total appropriation for the current fiscal year is \$885,610, which includes an increase over the preceding appropriation of \$25,000 for the purpose of telegraphing daily weather forecasts to small villages and farming communities, many of which are too remote from large cities to get the forecasts published in the daily papers. The public estimate of the value of the forecasts has so increased that from all sections of the country come numerous requests that the forecasts be telegraphed daily, instead of being sent only when rain or a material change in temperature is expected. The daily telegraphing of forecasts to display stations was begun July 9 and has proved highly satisfactory to the many and diversified interests so dependent upon coming weather conditions. The number of stations receiving daily forecasts October 1, 1895, will require an increase of about \$15,000 in expense for telegraphing over that of the preceding year.

HARMONIOUS WORK AND PROPER DISCIPLINE ESSENTIAL TO SUCCESS.

Harmonious cooperation between the practical worker and the scientific investigator is essential to success. Too often they have found themselves picking out diverging paths. In the future they will be required to work on parallel or converging lines.

In a system the ramifications of which extend into every State in the Union, success depends upon each worker being justly recognized for the merit that is in him, whether he be a skilled scientist or an able executive, and each should be given his proper place as an integral part of that great composite which constitutes the efficient bureau.

With observers at one hundred and twenty-one stations reporting their observations by telegraph at 8 a. m. and 8 p. m. each day of the year, and with the necessity for all observers to read their instruments at exactly the same moment of time, and to file with the telegraph company the complete and corrected result inside of twenty-five minutes, thorough discipline must be maintained in order to reduce to a minimum the number of cases where accident, sickness, or negligence causes the report to be missed. Such discipline is easily maintained without resorting to the harshness of military regulations, and it is safe to say that fewer observations are missed, and far fewer lapses from duty are recorded, than under any previous régime. The observers are, as a class, men of education and of a high standard of morality. The aim of the Chief is to encourage pride in good character.

CIVIL SERVICE.

Several discharges have been made for inefficiency. It is probable that the highest encomium that can be paid to the work of the Civil Service Commission is to say that, to the knowledge of the Chief,

no report of inefficiency ever has been made against an observer appointed upon certification by the Commission.

The method employed by the Civil Service Commission in selecting our observers, together with the supplementary examination provided by this office, can not well be improved on. The improvement in the public service due to this method of selecting employees was so patent that the Secretary of Agriculture, early in his administration, made use of the same system in the selection of employees whose rank and emoluments placed them above the civil service grades. These places have since been covered into the Civil Service by order of the President.

PERSONNEL.

It is the intention not only to maintain the high character of the personnel of the Bureau, but to improve it, and, with this purpose in view, the personal habits, as well as the official character, of its employees will be the subject of rigid inspection. Officials in charge of stations will be required to report as to the following conditions and qualifications of each subordinate: What is his general ability? What are his habits as to attention to duty? Do convivial habits in any way impair his efficiency? What is his standing in the community, officially and morally? Does he generally excel in all branches of work, or in some particular line? Is he married? How many depend on him for support? Does he live within his means?

INSPECTIONS.

While frequent inspections will be made by the Chief of the Bureau, any official of suitable rank may be detailed for this duty. A material saving in transportation may often be effected by making use of some official in the immediate vicinity to make the needed inspections. Officials so designated are admonished that if a dissolute or inefficient employee is passed by them without a proper report being rendered, they themselves will be held personally responsible.

NEW SERVICE.

On July 23 officials in charge of all stations were directed to prepare a list of the superintendents of street railways, general managers of railroads, superintendents of railroad telegraph lines, and managers of all other important interests in their vicinity, to whom should be sent, by such means as would secure the promptest transmission, warnings of cold waves, heavy snowstorms, or other information of special value to them. This system of specially warning transportation lines in the interest of the general public was put into operation at Chicago during the past winter by the present Chief of Bureau, and resulted in great saving of time to the traveling public and a curtailment of loss in revenue and property to the transportation lines.

NEW AND IMPROVED PUBLICATIONS.

On July 18 instructions were issued making such changes in the details of printing, editing, and issuing the MONTHLY WEATHER REVIEW as will shortly bring that publication up to date, instead of having it issued six months late, as has hitherto been the rule. This

publication contains the most complete compilation of meteorological data anywhere put forth, and it is intended to issue it not later than fifteen days after the expiration of the month for which it is a record. Special papers prepared by members of the scientific staff will, unless otherwise directed, first appear in this publication. The result of investigations now under way for the purpose of improving the official forecasts, and papers on future investigations into the philosophy of storms, will appear from time to time in its pages.

In December, 1893, the Secretary of Agriculture, in a communication to the Chief of the Weather Bureau, suggested that some method be devised whereby both the sanitary and the meteorological conditions existing throughout the various States of the Union might be regularly presented to the public through the Weather Bureau. He anticipated that an additional service of great value to the people of the United States might thus be rendered by the Weather Bureau. What had been done previous to the present Chief's assuming office was carefully reviewed by him, and, with some modifications in the original plan, the first publication of CLIMATE AND HEALTH was issued the latter part of September, 1895. It is presented to the medical and other professions, and to the public at large, as probably the most complete and comprehensive publication of contemporaneous meteorological and sanitary data so far put forth either by Government or private means. The object is to facilitate an intelligent investigation into the relations existing between meteorological conditions and disease. The publication will be monthly and the compilation of the data will be in weekly parts.

It may not be out of place to mention briefly what it is hoped may be accomplished by this publication. The practicability of utilizing the daily weather forecasts by the physician in his practice will be kept constantly before him, and it may reasonably be expected that something of value will thereby be added to our common stock of knowledge. It will present information in regard to climate and its relations to disease that are practically unobtainable from any other source. A knowledge of the relations existing between climatology and hygiene must precede the practical application of the one science to the other, and the facts must first be collected before this knowledge can be obtained.

Yet another good result will be the information developed concerning health resorts and climatic data of value to invalids. Immense sums of money are spent yearly by the invalids and valetudinarians of this country in seeking, by change of climate, alleviation or cure of their ills. Not infrequently these people find that they have abandoned the comforts of home, and undertaken long, tiresome, and expensive journeys to reach localities which they find totally unsuited to their needs. These migrations, in many instances, would never have been advised or undertaken had either physicians or patients possessed a full knowledge of the climatic conditions of many of these places.

An inquiry that naturally suggests itself is, "Will it be practicable to precisely forecast the appearance and progress of diseases?" To this a negative answer must for the present be given. It does, however, appear probable that by a diligent pursuance of this work some important conclusions as to the conditions favorable to the development of certain diseases may be arrived at.

IMPROVED COTTON-REGION SERVICE.

Beginning with September 1 the hour for taking observations at cotton-region, sugar, and rice stations was changed from 6 p. m. to 8 a. m., seventy-fifth meridian time. By making this change it has been possible to issue the cotton-region weather bulletins each morning for the twenty-four hours ending 8 a. m., and to issue it to the public and to the important cotton exchanges within two hours after the hour of observations, and to give the minimum temperature for the current morning and the rainfall for the past twenty-four hours. Heretofore the bulletins have been issued at 8 p. m., and as a rule they reached the public not earlier than the morning of the following day—from fourteen to sixteen hours after the time of observations—and the bulletins contained the minimum temperatures which occurred more than twenty-four hours before posting. The great advantage which will result from this change is obvious.

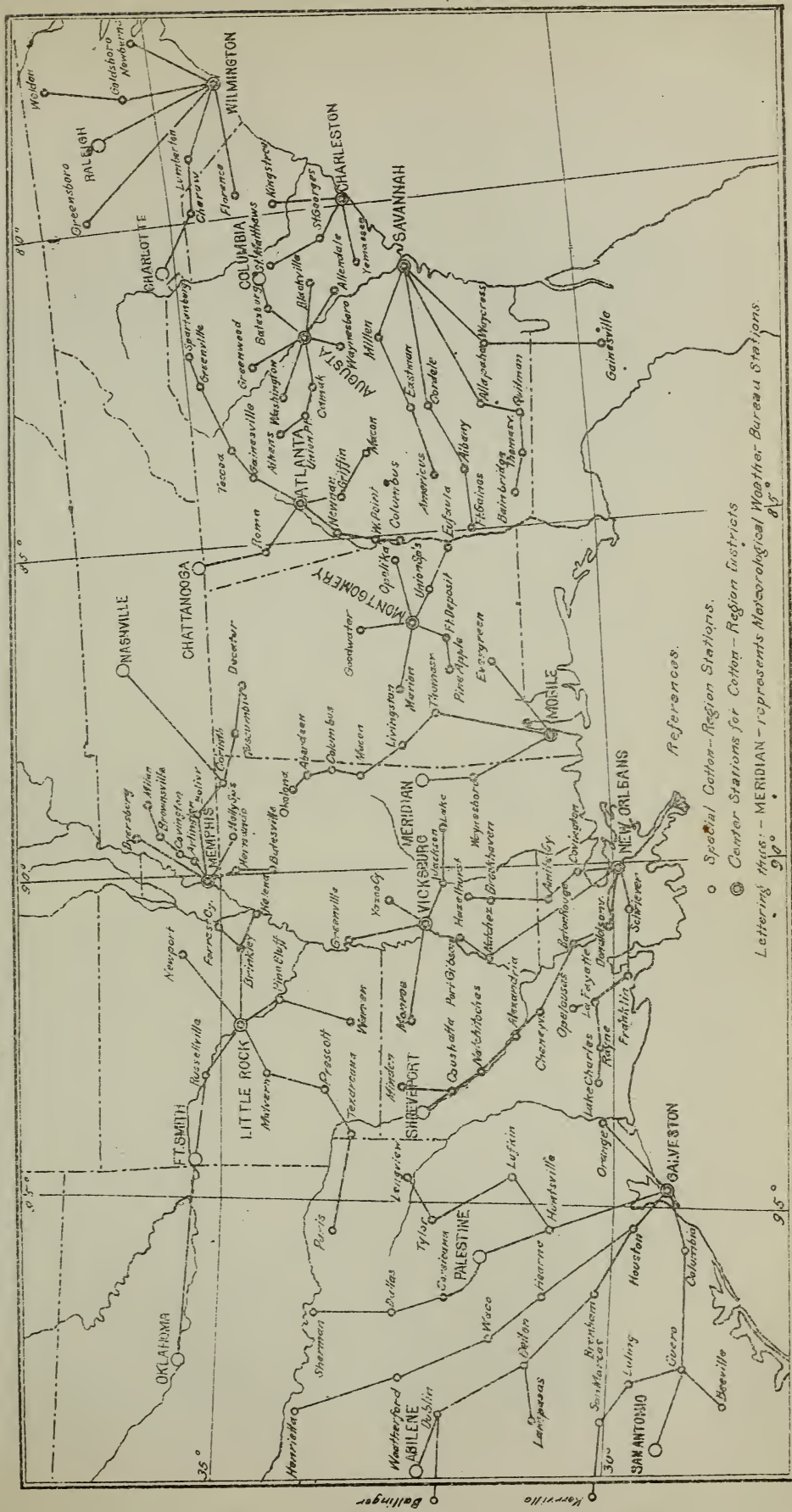
For several years it had been apparent that the service would be greatly improved by such a course, but the difficulties to be overcome in securing reports at so early an hour from stations in the western portion of the cotton region have heretofore been such as to deter the Bureau from ordering the change.

In the cotton, sugar, and rice growing regions of the South hundreds of millions of dollars are invested, and the state of the crop, as determined by weather conditions, is at all times a feature eagerly watched by the many interested in those staples.

The special service organized in the interest of the cotton, sugar, and rice interests is quite separate and distinct from the forecasting or storm-warning features of the Bureau, although the duty is performed with little additional expense. Briefly described, it may be said that each Weather Bureau station becomes a center to which, each morning, is telegraphed from a radius of 100 to 200 miles the temperature and rainfall from selected stations, these stations being manned by resident observers who receive for this service compensation at the rate of 20 cents per day. These reports are not needed specially for forecast purposes, and are gathered in order to show the current weather conditions, as affecting the staple products of the region, more minutely than can be done by the reports from the regular Weather Bureau stations, as they are, in many cases, 300 to 500 miles apart. From the reports received at the section centers the average rainfall and temperature is determined for each section, and this average is telegraphed to all other section centers. This information is strictly reliable and not subject to influences affecting those whose pecuniary interests might prompt them to disseminate erroneous information. The authenticity and reliability of these reports have never been questioned.

Since July 1 the pamphlet of instructions to cotton-region observers has been reprinted in a revised form, and an improved cipher code adopted. A new bulletin form (1045) also has been devised and will be put into use during the ensuing year. This bulletin provides for important weather information not heretofore given. It will contain a small outline map of the cotton belt, with location of district centers and all stations at which observations are taken. These maps will be used for illustrating graphically the daily temperature and rainfall conditions of the cotton region.

Chart I. Stations and District Centers in Cotton Region.



The cost of maintaining the cotton-region service, independent of the expense of telegraphing reports, for the seven and one-half months during which observations are made, is a little less than \$6,000 per annum.

WHEAT AND CORN SERVICE PROPOSED.

It is desirable that a service similar to the cotton-region service be organized in the principal wheat and corn sections during the coming year. In the estimates recently submitted for the year ending June 30, 1897, provision has been made for such service. Many interests, which in other ways are conflicting, are really unanimous in their desire for this detailed information, coming, as it does, from reliable sources, and being prepared by disinterested persons whose sole object is to render an accurate and impartial return. Chart I shows the cotton-region stations and the section centers.

It is thought that an efficient corn and wheat region service could be conducted with about ninety stations, grouped around nine or ten district centers, the latter to be regular Weather Bureau stations. The instrumental equipment for ninety stations would cost about \$1,600, the outfit for each station to be the same as that constituting the equipment of a cotton-region station, viz, a set of maximum and minimum thermometers, rain gauge, and thermometer shelter. At the same compensation as now paid cotton-region observers, viz, 20 cents per observation, the cost of maintaining ninety stations the year round would be about \$6,600 per annum. It is believed that it would be well to continue the observations throughout the year, as seeding of winter wheat begins shortly after the close of the spring-wheat harvest, leaving practically no interval during which these reports would not be of sufficient importance to justify their continuance.

ADDITION OF SENSIBLE TEMPERATURES.

On September 20 was begun the telegraphing from observation stations of the readings of the wet-bulb thermometer, more popularly known as the "sensible temperature." This is about the temperature felt by animal life, and may be many degrees below the air temperature, the difference between the two temperatures depending upon the relative humidity of the air—the drier the atmosphere, the lower the sensible temperature when compared with the air temperature; the damper the air, the higher the sensible temperature. This will be better understood when it is stated that in case the air be saturated the readings of the dry and wet bulb thermometers will be the same and the sensible temperature and the air temperature equal. In the arid regions of the West cases can be cited where the sensible temperature was 38° less than the air temperature, due to the extreme dryness of the atmosphere. In the more humid regions of the eastern part of the country such extreme differences can not occur. Both the air temperature and sensible temperature are now published on the charts issued at Washington, and it is probable that at all stations of the service these two temperatures will hereafter be published. The relative importance given to each in the discussion of the matter of forecasting, and in the discussion of meteorological conditions in the daily weather report, has not been entirely determined. It is

apparent that no true measure of heat, as applied to animal life, has heretofore been systematically published, and it is believed that the United States Weather Bureau will be the first to make the innovation. Its application is so simple and so easily understood by all that in the future it will doubtless form one of the most important features of Weather Bureau work, and it will serve to correct some very erroneous ideas in regard to climate entertained by people who have never considered anything but the air temperature.

UPPER AIR OBSERVATIONS PROPOSED.

The main object of the existence and maintenance of this Bureau is to give warning of the approach of storms. Our synoptic charts, from which forecasts are made, are based entirely upon what may be considered surface readings of air conditions, and while the degree of accuracy attained by the most expert forecasters is such as to render the forecasting work of the Bureau of vast benefit to the agricultural, commercial, and maritime interests of the country, there is still an element of error amounting to about 20 per cent, and our present knowledge of the mechanism of storms will probably permit of but little further increase in accuracy.

It is, therefore, highly essential to push forward such lines of scientific investigation as give the greatest promise of fruition. For twenty-five years we have been making readings at the bottom of the great ocean of air, while many believe that the subtle forces which combine to initiate storms and the constant accretion of forces which augment their energy as they move eastward, or which at times cause them unexpectedly to be dissipated after having reached a great degree of storm intensity, may be operative at great elevations. It is therefore desirable that upper air readings should be accomplished by this Bureau to determine the accuracy of these theories, and that synoptic charts based upon readings taken at an elevation of not less than two miles should be prepared, showing the conditions prevailing at that altitude throughout a considerable portion of the country. The difficulty is to devise appliances, which, while captive, will carry automatically recording instruments to the proper elevation under all conditions of wind velocity and variable direction; but the obstacles do not seem to be formidable, and it is believed that they can be successfully overcome. While the expectations of many may not be realized in obtaining knowledge which will enable us more accurately to forecast the coming of storms, the field is certainly promising enough to justify a moderate expenditure in thoroughly exploring it. With so much property and so many lives often dependent upon storm forewarnings, any line of investigation which holds out reasonable hope of improvement should be followed until proved to be fallacious. By dispensing with such work at the observation stations as can not be shown to be immediately useful, it is believed that, with practically no increase in working force, the line of investigation herein outlined can be prosecuted, and that the expenditure necessary will be only for material and the time of one or two thoroughly skilled officials to move from station to station establishing the necessary appliances for upper air readings. These appliances, however, have yet to be devised, and the contemplated system is consequently still in embryo.

WEATHER BUREAU BUILDINGS AND GROUNDS.

The present Weather Bureau buildings and grounds, situated at the corner of Twenty-fourth and M streets, were purchased by the Government from Mr. David Fergusson for the use of the Signal Corps, under an act of Congress approved March 5, 1888, which appropriated \$150,000 for the purpose. Of this sum \$112,000 was paid to Mr. Fergusson for the site, including the large building standing thereon, and the extra \$38,000 was expended for the erection of additional structures required for use as storehouses, printing office, stable, machine shop, etc., these latter structures being constructed under the supervision of the Treasury Department.

The site has a frontage of about 230 feet on M street, and an area of about 54,000 square feet, and, with the buildings thereon, was transferred to the Department of Agriculture, for the use of the Weather Bureau, on July 1, 1891, under the terms of the act of Congress of October 1, 1890.

It is thought that the market value of the ground alone is not less than \$1.50 per square foot, making the total value of the ground about \$81,000, exclusive of the buildings, because, if thrown upon the market, the property would doubtless be bought for the purpose of erecting small residences, in which case the present buildings would be of no value except for old brick.

IMPROVEMENT IN INSTRUMENTAL EQUIPMENT.

The growth of the service from year to year develops increased demands for meteorological information in behalf of commercial, agricultural, and engineering interests, and as the public, students, and specialists become more and more familiar with the details of the work of the Weather Bureau, new ways are discovered of rendering the results of its observations useful and beneficial to all. At the same time students and others become more and more exacting and critical in respect to the accuracy of the observations. To retain the confidence and respect of the people, the Bureau must see to it that its instruments and its methods of making observations are accurate in the highest degree and abreast of modern thought and opinion in such matters. The Bureau must be able to defend itself against any criticisms respecting the quality of its work that the growing intelligence of the public in meteorological matters may be able to make. The duties of the official in charge of instruments are but badly administered unless stimulated by an intelligent interest in the development of more perfect instruments and methods of observation, and in the increase everywhere of the uniform accuracy of the observation work of the service. The observations supply the facts upon which the whole meteorological work of the Bureau rests. Their accuracy is, therefore, a matter of primary importance. Without a proper regard for these considerations, improvement and progress in the duties relating to instruments are not possible, and all such work is degraded to the level of mere perfunctory performance. It is clear, from the cursory view of the case here presented, that affairs relating to instruments merit, by virtue of their importance, a prominent place in the organization of the Bureau.

DANGERS OF TORNADOES EXAGGERATED.

The popular ideas as to the destruction of life and property by tornadoes (often improperly called cyclones) are generally exaggerated. All the reports of violent local storms of all kinds and of deaths caused by them, as obtained from newspapers and observers of the Weather Bureau during the past five years, have been examined and are given in the accompanying table, together with the number of true tornadoes:

	1890.	1891.	1892.	1893.	1894.	Total.
Reports	347	297	563	661	625	2,493
Deaths	273	108	276	399	236	1,292
Tornadoes	33	8	28	51	30	150

We generally have an idea that when one of these tornadoes is reported it shows widespread destruction, but in reality a tornado's path is long and very narrow. The total area of destruction by the largest single tornado has never exceeded 10 square miles. The chance that any township 6 miles square will be visited by a tornado within a century is not one-half of 1 per cent.

An examination of reports also shows that the number of deaths by lightning almost equals that by tornadoes.

It is not at all probable that the number of tornadoes is on the increase in this country, but as the number of towns and their inhabitants increase in the tornado regions, a dread of their visitation must correspondingly increase, and the ingenious will strive to provide means of protection.

It can not be too clearly stated that these terrific atmospheric disturbances nearly always move from west to east or southwest to northeast, and that persons endeavoring to escape from their line of progression should, as a rule, flee toward the northwest or southeast. In a paper recently prepared by Prof. H. A. Hazen of this office, the statement is made that—

So far as known no one has ever lost his life when in the ordinary cellar of a house, and this may be regarded as ample protection. In many parts of the West so great is the dread of a tornado that timid persons sometimes spend a half day at a time in a tornado cave when the sky has a greenish or peculiarly threatening appearance in the west. As a matter of fact, the genuine tornado always makes its presence known by an unmistakable and indescribable roar. Some have heard this roar a half hour before the storm struck, and the cases are rare where it has not been heard fifteen minutes before. This single fact should serve to allay the fears caused by ominous clouds on a hot summer afternoon.

In the sections where tornadoes are frequent the annual loss due to them is only about one-fourteenth that caused by fire.

VALUE OF RECENT HURRICANE, FROST, AND RAIN WARNINGS.

The season so far has been unusually free from those destructive storms which often, in the early fall, move from the West Indies northwestward into the Gulf of Mexico and thence recurve to the northeast and cause destruction on our Atlantic coast.

From August 24 to 29, inclusive, a hurricane moved from south of the Island of Cuba in a westerly direction and reached the extreme southern coast of Texas. No material damage was done, as all shipping was warned well in advance by telegraphic information sent from the central office to ports along the Gulf coast.

The Corpus Christi Caller says:

Last Monday the observer here gave notice of a storm entering the Gulf and cautioned all boats about going out. Still there was no sign of a storm at Corpus Christi, the weather being clear and beautiful. Tuesday further information was received from the Chief of the Weather Bureau giving notice that the storm in the Gulf was moving toward the central Gulf coast and notifying the shippers that it was not safe to leave port, and still the weather was clear at this place. Wednesday evening still further information was received of the approaching storm, with instructions to hold shipping until further notice. It was not long after this before our people commenced to hear the old Gulf roar and to notice their barometers falling and the wind increasing from the northeast. Yesterday morning it was evident that the blow was upon us, though not so severe as it was outside. One thing is sure, the Weather Bureau has done its duty in giving timely notice and warning of this storm from the high seas. The Bureau located the storm from its commencement, kept track of it, and reported it right along until it got here.

This emphasizes the importance of the West Indian cable-reporting stations of this Bureau. In the storm just reported the station at Merida, near the north coast of Yucatan, was especially useful as indicating the westerly direction of the hurricane and in rendering it possible for the Weather Bureau to locate the center of the hurricane as being northward in the Gulf of Mexico.

The abnormally hot weather prevailing east of the Rocky Mountains from early in September until the 20th of that month was broken in the West on that date by a marked cool wave, with frost, moving in from the Rocky Mountain plateau region. On Sunday morning, September 22, at a time when temperatures ranging from 85° to 95° prevailed throughout the greater part of the Mississippi and Ohio valleys and Lake region, over 2,000 telegrams were distributed by the Weather Bureau in the regions mentioned, giving warning that the temperature during the next twenty-four to thirty-six hours would fall not less than 30°. The prediction was of great benefit to the people, and was fully verified throughout the entire region. In some cases the change in temperature amounted to 40° inside of twenty-four hours. The advance of the cool wave eastward to the Atlantic Ocean in a modified form was also successfully forecasted. Extensive and favorable comment was made on the work of the Bureau in this instance.

Frost, which did considerable damage to tobacco in the Ohio Valley on September 30, was successfully forecast the morning of the 29th and warnings distributed throughout the threatened districts, doubtless resulting in a considerable saving of this valuable crop by inducing growers to cut and house much of the plant. This frost was also successfully forecast twenty-four hours in advance until it reached the middle Atlantic coast States, although little or no damage was done farther eastward.

On Wednesday, September 11, the forecast official at San Francisco became convinced that the rain then prevailing in the northern portion of the State would, within a few hours, extend to fruit regions in the vicinity of Fresno, and sent rain warnings to the observer at

that place, by whom they were widely distributed to horticulturists. The official has been informed by extensive fruit growers that these warnings were worth probably many thousands of dollars, as they enabled the growers to gather the trays of drying fruit and stack them before the coming of the rain. The fruit industry of California is more extensive than that of any other State in the Union, and none, perhaps, is more dependent upon the Bureau for success. In early spring frosts frequently occur during the period when fruit is blossoming and setting. The people are well educated in regard to protecting fruit from frost when warnings are received, and many instances have occurred where orchards have been protected owing to the warnings of this Bureau. During the season from June 1 to October 1 many fruits are dried in immense quantities in trays exposed to the sun. The fruit thus dried is superior to that cured by artificial evaporation. It is liable to be injured by unexpected rain or by high winds blowing dust into the newly cut fruit. Protection can be had from both these conditions by stacking the trays one upon another.

From August 15 to December 15 large quantities of raisins are dried. Unexpected rains are especially injurious to this product, since the rain penetrates the bunches of partly dried fruit and seldom evaporates before mold sets in.

The warning of September 11, therefore, was of great benefit to the fruit industry.

The San Francisco Call of September 13 says:

As a result of the warnings of the Weather Bureau thousands of dollars were saved to the raisin growers to-night. Ample time was had for stacking the trays and protecting them from rain.

The Fresno Morning Republican of Thursday, September 12, says:

Rain, which began falling in this city last evening, did not come so suddenly or unexpectedly that the vineyardists had no time to prepare for it. The system of signals perfected by the Weather Bureau has been of much assistance to the people in getting ready for rain. By this arrangement flags are displayed in every important raisin district of the county, and there are very few vineyardists out of sight of one or more flags. Vineyardists had warning in time to stack their trays.

The San Francisco Chronicle says:

The threatening weather and warnings sent out by the Weather Bureau gave the vineyardists time enough to stack their trays, but considerable loss will result nevertheless.

REPORT OF THE CHIEF OF THE BUREAU OF ANIMAL INDUSTRY.

SIR: I have the honor to transmit herewith a report of the operations of the Bureau of Animal Industry for the fiscal year ending June 30, 1895, together with some remarks on the character of the work of the Bureau and certain recommendations for the enlargement of its scope and usefulness.

Respectfully,

D. E. SALMON,
Chief.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE YEAR.

MEAT INSPECTION.

The inspection of meat has been during the whole fiscal year the most extensive and urgent work in which the Bureau has been engaged. Every effort has been made to inspect all the animals slaughtered for the interstate and foreign trade at the cities where the inspection has been inaugurated. Sheep and calves have been included to a greater extent than in former years.

The number of animals inspected at the abattoirs was 18,575,969, consisting of 3,752,111 cattle, 1,137,300 sheep, 109,641 calves, and 13,576,917 hogs. During the preceding year the total number inspected was 12,944,056. The increase has consequently been 5,631,913, or about 43 per cent. In addition to this, an ante-mortem inspection was made in the stock yards on 5,102,721 animals.

The force of inspectors was placed in the classified service by order of the President at the beginning of the fiscal year. This force has been increased as rapidly as was warranted by the list of eligibles obtained by the Civil Service Commission through its examinations. The inspectors and assistant inspectors appointed from this source have been in nearly all cases intelligent, competent, and faithful men.

The cost of this inspection was \$262,731.34, or an average of 1.1 cents per animal inspected. The cost of the inspection per head has been steadily decreased. In 1893 it was $4\frac{3}{4}$ cents per head, and in 1894 it was $1\frac{3}{4}$ cents.

The inspection was maintained at 55 abattoirs, situated in 18 different cities. During the preceding year the inspection was conducted at 46 abattoirs in 17 cities. The inspection was more complete and thorough at all points than it has been during any previous year.

MICROSCOPIC INSPECTION OF PORK.

There were 45,094,598 pounds of microscopically examined pork exported during the year, as compared with 35,437,937 pounds in 1894 and 20,677,410 pounds in 1893. There were 905,050 carcasses and 1,005,365 pieces examined, making a total of 1,910,415 specimens for the microscopical force to inspect. The cost of this branch of the inspection was \$93,451.10, and the average cost per specimen examined was 4.9 cents. In 1893 the cost per specimen was $8\frac{3}{4}$ cents, and in 1894 it was $6\frac{5}{8}$ cents. There was, consequently, a reduction of 25 per cent in the cost of inspection in 1894 as compared with 1893, and a further reduction of 25 per cent in 1895 as compared with 1894. The cost of inspection per pound of inspected meat exported was reduced from 0.248 cent in 1894 to 0.2 cent in 1895.

INSPECTION OF EXPORT ANIMALS.

The number of cattle inspected for the export trade was 657,756, as against 725,243 during the previous year. The number actually exported was 324,299. The number of cattle exported in 1894 was 363,535, and there was, consequently, a falling off of 39,236 head. Of the cattle inspected 1,060 were rejected for exportation, as compared with 184 in the preceding year.

The number of sheep inspected for the export trade was 704,044, the number exported being 350,808. The exports of sheep in 1894 were 85,809. The increase has, therefore, been 264,999, or over 300 per cent.

It is seen from the above statement that 1,361,800 head of animals were inspected for the export trade, and that a total of 675,107 animals were exported. All of the cattle were tagged with numbers, and these were registered, in order that individual animals might be identified, if necessary.

It has been found somewhat embarrassing to certify to the healthfulness of sheep under present conditions, as, although healthy when inspected, they sometimes become affected with scab before they are landed. The crowding of large numbers of these animals together on board ship, together with the atmosphere by which they are surrounded, favors the rapid development of scab, and in case any of the parasites of this disease are present there is an extraordinary development of the symptoms during the voyage. Flocks which are carefully examined and found free from any symptoms of disease at the time of loading were discovered to be badly affected when they were landed in European countries.

Long and careful consideration has been given to the different measures that might possibly be adopted to prevent infection with this disease. No doubt some of these sheep are infected in cars which had previously carried diseased animals, others are infected in stock yards through which they pass, and still others may be infected from the ships. It is evident that to guard against all these sources of infection, comprehensive regulations are required that will secure disinfection of ships, cars, and stock yards, and, most important of all, that will prevent the shipment of diseased sheep to market.

VESSEL INSPECTION.

The vessels carrying the exported cattle and sheep were all inspected by the officers of this Bureau, in accordance with the act of Congress approved March 3, 1891. New and revised regulations were issued embodying the amendments which had been suggested by practical experience during the time the law has been in operation.

The losses during the year have been unusually heavy. The record, which had previously shown smaller and smaller losses during each succeeding year that the Department regulations were in force, has been so completely changed that an investigation has been commenced to determine whether any part of these losses was due to noncompliance with the regulations.

Of the cattle exported to Great Britain, 294,331 were inspected at the time of landing, and the loss in transit was found to have been 1,836 or 0.62 per cent, as compared with 0.37 per cent in 1894. The number of sheep inspected after landing was 310,138, and there had been lost out of these shipments 8,480, or 2.66 per cent, as compared with 1.29 per cent in 1894. The losses were due to a variety of accidents, some of which apparently could not have been avoided. Others appear to have resulted from insecure fittings. There are some vessels which do not regularly carry animals, but occasionally take a consignment when good freight rates can be obtained or when other cargo is not available. With these the fittings must necessarily be of a temporary character, and can not be given the security which is obtained with the permanent fittings of the regular cattle boats. If it appears after careful investigation that the losses are due to temporary or otherwise insecure fittings, it is evident that a more rigid inspection must be enforced and that vessels which are unsafe must be denied the privilege of carrying live animals.

STOCK-YARDS INSPECTION.

The stock-yards-inspection service is maintained to prevent the spread of contagious diseases through the channels of interstate commerce. At present Texas or Southern cattle fever is the only disease controlled by this inspection. With the further development of the force engaged in this work it will probably be found advisable to include other diseases, such as sheep scab, hog cholera, and tuberculosis. It is probable that the ravages of the first two of these diseases may be very materially reduced by guarding against the contamination of animals in transit; and that, after our people had experienced the benefits to be derived from such measures, they would be no more willing to dispense with them than they now would be to go back to the methods under which the stock yards and cars were continually infected with Texas fever.

During the quarantine season, from February 15 to December 1, 1894, there were received from the infected district and inspected at the quarantine pens 30,531 car loads of cattle, containing 826,098 animals. There were 8,958 car loads inspected in transit, and 28,650 cars cleaned and disinfected under supervision of the inspectors. There were also inspected 156,660 cattle from the noninfected section of Texas which were shipped or driven to Northern States for grazing and feeding purposes. It was necessary to identify the brands of these cattle to determine if they could be safely used for this purpose.

The cost of the Texas fever and export inspection was \$104,492.46. Assuming that half of this should be charged against the inspection of export animals, the cost of inspecting the 675,107 cattle and sheep exported would be \$52,246.23, or 7.74 cents per head. The average cost during the preceding year, computed in the same manner, was 10.75 cents. The number of individual inspections made on these animals was 1,361,800 in this country, and 604,469 in Great Britain, a total of 1,966,269. This gives an average cost of 2.66 cents for one inspection of each individual animal.

INSPECTION AND QUARANTINE OF IMPORTED ANIMALS.

The number of animals imported and quarantined during the year was as follows: At the Garfield station, 142 cattle, 146 sheep, 23 swine, 3 moose, and 9 India cattle. At Littleton, 12 sheep. At Buffalo, 366 cattle. At Port Huron, 1 head of cattle. Altogether 702 imported animals were held in quarantine for the prescribed period. There were inspected 293,594 animals imported from Canada, but not subject to quarantine, as follows: Sheep, 292,613; swine, 908; cattle, 48; moose, 5. There were also inspected 63,716 Mexican cattle imported into the United States from January 1 to June 30, 1895.

SCIENTIFIC WORK.

Important scientific investigations have been in progress which have yielded valuable results, while with others the objective point has not yet been reached.

A subject of investigation which promised well was the application of mixtures to Southern cattle with the idea of destroying the ticks upon them and thus avoiding the danger of disseminating Texas fever. A considerable number of insecticides have been experimented with and marked progress has been made, but a thoroughly reliable mixture for this purpose has not yet been discovered. It is probably only a question of time and research when such a discovery will be made. The mixtures so far used which kill all of the ticks are too irritating to the skin of the cattle, while on the other hand those which are not irritating to the cattle do not kill all of the ticks.

Investigations concerning the nature of various animal diseases, particularly of a hitherto undescribed but very destructive disease of turkeys, will be published in special bulletins.

During the fiscal year ending June 30, 1894, the laboratory has sent out on application of the proper State authorities tuberculin sufficient to test 35,000 cows, and mallein sufficient to test 1,200 horses.

ESTABLISHMENT OF DAIRY DIVISION.

Action has been taken for the establishment of a dairy division to be organized July 1, 1895, with a chief, an assistant, and two clerks. The work of this division for a considerable time in the future will be for the most part confined to the collection and dissemination of information concerning the dairy industry as it exists. Original scientific investigations bearing on this subject must be postponed until a foundation has been laid in other directions, and special facilities for research have been acquired. There is, however, a vast amount of information of the greatest value to the dairyman which may be secured by observation and correspondence. This relates to the condition of the industry, statistics of production and trade, markets, and improve-

ment in the manner of producing and handling dairy products. The present is an era of rapid changes, and the dairyman on this account needs a reliable source from which to obtain a knowledge of the latest modifications in the trade and the most desirable improvements which have been suggested.

The great dairy interest has been so long neglected by the United States Department of Agriculture that a special effort should now be made to press forward the work outlined above and to establish intimate relations with the dairy organizations of the country.

PUBLICATIONS.

There have been published during the fiscal year the following reports, bulletins, and circulars:

Report of the Chief of Bureau of Animal Industry for 1893. (Reprint.)
Bulletin No. 7. Investigations Concerning Bovine Tuberculosis.
Circular of Information No. 1. Directions for the Sterilization of Milk.
Circular of Information No. 2. Wheat as a Food for Growing and Fattening Animals.
Farmers' Bulletin No. 24. Hog Cholera and Swine Plague.

APPROPRIATION AND EXPENDITURE.

The appropriation for the year was \$800,000, and expenditures so far have not exceeded \$533,000. When all accounts are finally closed the unexpended balance to be turned into the Treasury will certainly exceed \$250,000.

REMARKS AND RECOMMENDATIONS.

The work of the Bureau of Animal Industry is more comprehensive and affects interests of a greater magnitude and to a larger degree than is generally appreciated. It is now conducted in accordance with legislation which experience has shown to be defective in many respects. This legislation imposes the duty and responsibility of preventing the introduction and spread of the contagious, infectious, and communicable diseases of animals; of inspecting animals about to be slaughtered, and certifying to the healthfulness of their products; of inspecting animals about to be exported, preventing the exportation of those diseased, and certifying to the healthfulness of those shipped; of inspecting vessels carrying such animals, and requiring proper space, fittings, and care; of investigating diseases not thoroughly understood and discovering how to control them; of investigating the different branches of the animal industry and supplying information by which they may be more profitably conducted.

The greater part of this work is of an executive nature, and to be effective the regulations must be in many cases arbitrary, inflexible, and thorough. A service to prevent the spread of disease among animals which fails to accomplish its purpose, or an inspection of meats which gives no protection to the consumer, is an injury to the country rather than a benefit; that is, any attempt to accomplish such results is accompanied by the expenditure of money, and necessarily interferes with trade and commerce, damaging some people and benefiting others, and should only be tolerated because it brings great good to the community, or will do so within a reasonable time. This being admitted, it is apparent that the laws and regulations under which the executive work of this Bureau is performed should be so perfected that the objects of the work may be accomplished as completely and with as little delay as the nature of the subject will permit.

THE SHIPMENT OF ANIMALS AFFECTED WITH CONTAGIOUS DISEASES
SHOULD BE PROHIBITED.

In the appropriation act for the last two years tuberculosis in all animals and scab in sheep have been mentioned as diseases the control of which is specially authorized. This being the case, I would recommend that regulations for preventing the spread of contagious diseases, under the acts of May 29, 1884, and March 2, 1895, be issued, and that these be made to prohibit the shipment from one State into another of any animal affected with any contagious, infectious, or communicable disease, and particularly with tuberculosis, sheep scab, hog cholera, and swine plague. These diseases are disseminated, and are, to a large extent, due to contagion carried through the channels of interstate commerce. They can never be controlled or their ravages greatly diminished until these interstate channels of commerce are thoroughly supervised and purified, and this purification must include all of these channels, the stock yards in which the animals are unloaded, watered, and fed, as well as the railroad cars and boats which transport them.

NECESSITY FOR DISINFECTION OF STOCK YARDS AND STOCK CARS.

Recently a large export trade in live sheep has been established, and this trade is menaced by the discovery of scab in many lots when they are landed in foreign countries. Although these sheep are very carefully inspected before they leave American ports and all affected lots are rejected, the disease continues to appear during the voyage. This is due to exposure in the stock yards and cars or to infection on the vessel. The vessels are thoroughly cleaned and whitewashed each trip, so that the stock yards and stock cars are for the most part responsible. The unrestrained shipment of scabby sheep in this country has undoubtedly thoroughly infected the channels of commerce, and we can not expect to prevent or eradicate the disease until these channels are freed from the contagion and protected from its further distribution. It is not sufficient to guard against the shipment of affected animals, because, the yards and cars being infected, the animals which pass through them will continue to contract the disease.

The companies which own and operate railroads and steamboats carrying stock in transit from one State into another, and stock yards forming a part of the channels of interstate commerce, should be required by law to disinfect them whenever this is directed, under regulations of the Secretary of Agriculture. This is absolutely necessary to prevent the spread of contagious diseases from one State into another. It is useless to provide penalties for the interstate shipment of diseased animals, so long as the sound animals must be exposed and become infected during transit. An amendment to the law by which proper disinfection may be effected is extremely important for the protection of both the export and the domestic trade.

THE CHANNELS OF INTERSTATE COMMERCE SHOULD BE GUARDED
FROM INFECTION.

To properly guard the interstate trade, it is also necessary to extend the provisions of the act of May 29, 1884, so as to prohibit the shipment of diseased animals or infected stock upon railroads (1) that form a part of a line used for transporting stock from one State into another; or (2) which use cars that are allowed to go into other States; or (3) which

transport animals to stock yards that are in the channels of interstate commerce. The law as it stands gives its whole attention to diseased or infected animals, but infected cars and infected stock yards are not given consideration. If, for example, a railroad company knowingly ships animals affected with a contagious disease from any part of the State of Illinois to the Union Stock Yards at Chicago, although they deliberately infect the channels of interstate commerce and endanger the stock interests of the whole country, there is apparently nothing in the Federal law under which they may be punished or restrained.

A case of the kind just mentioned has actually occurred during the past summer. Cattle known to be infected with Texas fever were shipped from a point in Illinois to the Chicago stock yards, and when the railroad company was requested to disinfect the cars in which these animals were shipped they refused, asking the Department to point to the provision of the statutes which compelled them to do so, as they had not shipped the animals from one State into another. So long as these fatal defects exist in the law, how can we guarantee our export cattle as free from Texas fever infection, or our export sheep as free from scab? And yet the very existence of this export trade depends upon the complete exclusion of contagion in all forms.

The losses from contagious diseases of animals in this country due to the dissemination of the contagion through stock yards and cars is not fully appreciated, and is certainly enormous. Most of the outbreaks of hog cholera originate from hogs purchased in the markets and shipped for feeding. Most of the cases of foot rot, scab, and Texas fever are also accounted for in this way. There is, consequently, so much depending upon the purification of our channels of commerce that I unhesitatingly invite your early attention to this subject.

IMPORTED AND EXPORTED HORSES SHOULD BE INSPECTED.

Horses brought from foreign countries are liable to be infected with various contagious diseases, such as glanders, *maladie du coït*, and foot-and-mouth disease. There is, consequently, the same necessity for their inspection at the port of entry that exists with ruminants and swine. Unfortunately there is no authority in the law for such inspection, and horses are allowed to enter the country without any sanitary supervision. This trade, as at present conducted, is therefore a menace to the animal industry, and I renew the recommendation of my last report that the subject be brought to the attention of Congress, with the view of securing additional legislation. If such imported animals, on inspection, are found affected with a dangerous contagious disease they should be refused entrance and either slaughtered or returned to the country whence they came.

Horses for export should also be inspected and certified the same as are other species of animals. Our exports of horses are becoming quite heavy, and the lack of inspection should not be allowed to stand as a reason for other countries to prohibit the trade, particularly as the inspection may be conducted by the force already in the field and with no appreciable increase in the expenditures. The question of contagion has already been raised by certain foreign countries in connection with exported horses, and it cannot be properly met by this Government until authority is given by Congress to inspect and certify healthy horses and reject those affected with contagious disease.

EXPENSES OF QUARANTINING IMPORTED ANIMALS.

The act of August 30, 1890, provides "That the Secretary of Agriculture be, and is hereby, authorized, at the expense of the owner, to place and retain in quarantine all neat cattle, sheep, and other ruminants, and all swine, imported into the United States." There is, however, no means provided in the law by which the expenses of quarantine may be collected in case the owner refuses to pay. It has been assumed that the expenditures necessary for the feed and care are a lien upon the animals, and that, in case of the owner's refusal to pay, the animals may be sold and the proceeds used to defray such expenses. The experience of the past year has shown, however, that in the absence of specific legislation authorizing the sale of the animals embarrassing complications may arise. It is desirable, therefore, that the law should be amended so as to give a lien upon imported animals for the quarantine expenses, and authorizing their sale at the expiration of the quarantine period in case such expenses are not paid. This provision should also apply to animals smuggled across the boundary and afterwards captured and quarantined, as well as to those which have in any other way evaded the requirement for inspection and quarantine at the port of entry.

MEAT INSPECTION; SOME SUGGESTIONS FOR THE IMPROVEMENT OF THE SERVICE.

It has been shown above that during the last fiscal year there were inspected more than 18,000,000 animals at the time of slaughter. This demonstrates the rapid extension of the meat-inspection service, and indicates the near approach of the time when the provisions of sections 2 and 3 of the act of March 3, 1891, as amended in the act of March 2, 1895, must be strictly enforced. Briefly, these sections provide that no beef shall be exported unless the cattle from which it is produced are inspected before slaughter, and a certificate of inspection accompanies the beef; also that all cattle, sheep, and hogs must be inspected prior to their slaughter in case the meat made from them is to be shipped from one State into any other State.

These provisions are mandatory; they apply to the whole country, and as the trade and other interests involved are enormous there should by all means be an effort to perfect the law before they are put into effect. The amendments which I would suggest to perfect the meat-inspection law (act of March 3, 1891) are as follows: Section 2 should be amended to read—

That the Secretary of Agriculture *may* also cause to be made a careful inspection of all live *domesticated animals* the meat of which is intended for exportation.

The object of withdrawing the mandatory language and making this inspection discretionary with the Secretary of Agriculture is to avoid a demoralization and possible ruin of a part of the export trade which can not comply with the requirements of this section. Inspected beef is purchased in the carcass by retailers who sell at retail the portions suitable for their trade and dispose of what remains to packers, who cure it for export. This meat, although inspected at the time of slaughter, loses its identity before it reaches the packer, and unless some satisfactory means of marking the individual cuts can be devised, it will be impossible to certify it, and consequently it can not be exported.

There is also a large quantity of beef prepared in small slaughter-houses where there is no Federal inspection, and where from the small business done by each individual plant this inspection can not be established. Particular cuts of this meat which are not salable in the local trade are packed for export. The law as it stands would entirely prevent this trade.

There is also a market for uninspected meat in certain countries where the people are willing and desirous of purchasing it upon the reputation of the packers. There is no apparent reason why this trade in uninspected meat should be prohibited by the United States when the countries consuming it are satisfied with it. To do this will reduce our export trade without securing any benefit in return. It is forcing inspected meat upon the inhabitants of other countries where inspection is not desired, at great expense to ourselves, and at the same time forcing the undesirable cuts and uninspected meat upon our local markets to be consumed by our own citizens.

The foreign trade should, however, be given ample protection. There should be an inspection maintained to include the meat of all species of animals, in order that any country which desires only inspected products might provide in its laws for the prohibition of the uninspected. Exporters should also be required to plainly mark all packages of meat in such a way as to indicate the species of animal from which it was derived, and a penalty should be provided for failing in this or for incorrectly labeling it. This, it appears to me, is as far as we are called upon to go in protecting the citizens of other countries. There should be the same authority for inspecting and certifying other kinds of meat for export that is given for beef. The trade is just as important and there are the same reasons for requiring certification.

The last clause of section 2, which prohibits the issuance of a clearance to any vessel having on board beef not certified, should, if these suggestions are accepted, be stricken out.

Section 3 should include all domesticated animals, as well as cattle, sheep, and hogs. The shipment of uninspected meat should be prohibited, except under such regulations as may be made by the Secretary of Agriculture, and a penalty fixed for any violation of this provision.

Section 4 should give authority to treat condemned meat in such a way as to absolutely prevent its being sold and used for human food. There is very little gained by condemning meat unless it is at the same time saturated with coal oil or carbolic acid, or rendered in the fertilizer tank. The inspector may require a condemned carcass to be removed from an abattoir, but how can he prevent its being returned by an unguarded door, or during the night, and used in the interstate trade? It would be impossible in most cases to identify such condemned meat, and if it were shipped to another State in violation of the law the shipper could not be convicted.

The only way to make the inspection entirely satisfactory is to provide that whenever and wherever unwholesome or diseased meat is found by the inspectors it shall be made inedible, and the community in that way protected from its subsequent sale as a food product. The theory of the law as it was enacted, no doubt, was that the penalty provided was sufficient to prevent interstate and export shipment of condemned meat and that the local authorities should prevent its sale within the city and State where the slaughtering is conducted. Experience in the endeavor to enforce this inspection shows that the provisions of the law are not adequate to prevent the interstate and foreign shipment of condemned meat, and the Department has been compelled to instruct its inspectors

to see that it is tanked, or in case of refusal to do this the firm conducting the business is required to make a statement showing what disposition is made of it. In this way a partial remedy has been found. On the other hand, it has been made plain that in most cases the local health authorities can not be relied upon to take charge of the condemned meat and cause its destruction.

The best equipped municipal boards are those of the large cities, but even these seldom have more than three or four men available for the meat-inspection service, and they are all needed at establishments which slaughter for local consumption. Too often, as experience has shown, the municipal inspectors know little if anything concerning the diseases of animals. They appear to be selected because of their skill and activity in other lines of effort. They belong to the class of men who delight to magnify their office. When an attempt is made to cooperate, they take issue with the Federal inspectors as to their decisions, insisting upon passing meat which has been condemned and condemning meat which has been passed. Such an attitude at once causes friction, brings discredit upon the inspection, makes effective cooperation between the Department and the health boards impossible, and leads to a much less satisfactory condition than where no cooperation is attempted.

If the local health boards would accept the decisions of the Federal inspectors as final, and instruct their inspectors to see that all condemned meat was properly disposed of, thus avoiding conflicts of opinion and authority, much good would come from cooperation, and the great difficulty as to what should be done with condemned meat would be largely overcome. The writer has endeavored to secure such harmonious cooperation, and at the recent meeting of the American Public Health Association presented a report, as chairman of the committee on animal diseases and animal foods, urging the value and necessity of cooperation to prevent the sale of meat from diseased animals. As nearly all the local health boards are represented in the association named, there is reason to hope that some of them will give this matter more attention in the future than they have in the past.

The city inspectors are generally embarrassed in very much the same way as are those of the Bureau of Animal Industry. The latter are instructed that if an abattoir company insists upon selling condemned meat within the State where slaughtered it has a right to do it, subject, of course, to local regulations; while the city inspectors are instructed that meat which is not offered for sale within the city does not come under their jurisdiction. The superintendent of the abattoir may, consequently, say to the Federal inspector, "I shall sell this condemned carcass within the State;" and to the city inspector he may say, "This meat is for shipment to a distant part of the State." As the State boards are seldom, if ever, represented by an inspector, the condemned meat goes upon the market in spite of Federal and municipal cooperation. Worse than all, when the carcass passes beyond the sight of the inspectors, the condemned tags are removed, it is sold to innocent parties, and may then be shipped to another State, without anyone being legally responsible for violating the act of March 3, 1891.

Again, there are large abattoirs which are situated beyond the jurisdiction of the city boards of health, in sparsely settled districts, where there are no local health officers, and where the community can not afford to maintain an inspection service. Such communities may not be interested in destroying the condemned meat of the abattoirs. These

establishments are operated primarily to prepare meat for the interstate and export trade. The condemned meat, which is excluded from interstate trade, may be shipped to the nearest city within the State and there sold as sound and wholesome. The municipality where the abattoir is operated is not injured; on the other hand, a majority of its citizens are directly interested in the success of the plant, and any local regulations are more likely to be enforced for the protection of the abattoir than for guarding the health of other sections of the State or country. Here also, unless the Federal inspectors are authorized to require a proper disposition of unwholesome meat, it may find its way to market.

Each State might provide an efficient method of cooperation by enacting legislation making it illegal to sell for human consumption within the State any meat condemned by the Federal inspectors, or any meat prepared from animals condemned by such inspectors, unless the animals are held a sufficient time before slaughter to enable them to recover and become fit for the production of food products. This would obviate the necessity for applying a State meat-inspection service to the abattoirs which have Federal inspection, and, by leaving the enforcement of the law in the hands of local authorities already constituted, the full benefit of the inspection could be secured at very slight expense.

The only reason, which occurs to me, why this plan of cooperation may not be adopted, is the uncertainty of its being accepted by all of the States or by any considerable number of them. No States have yet shown a disposition to take such action—possibly because it has not been suggested from the proper sources.

The problem, however, is a very urgent one, and the meat-inspection service will not be in a satisfactory condition until it is solved. State legislation authorizing cooperation would require considerable time for its consummation, even if taken up at once and pressed forward as rapidly as possible.

Under the condition of affairs as we find them to-day, and we can not expect any great change in the near future except by Federal legislation, the simple exclusion of condemned meat from interstate shipments at the abattoir means that it will be sold locally; it will go into the hands of innocent parties, lose its identity, and may possibly be shipped to other States. The only result that would be reached by the Federal inspection, under such regulations, would be to take the diseased meat out of the export and interstate trade at the abattoirs and throw it upon the local market, to be finally sold for consumption within or without the State, as the inclination of the dealers may decide. Is it fair and just that the Federal Government should conduct an inspection which takes the diseased meat from the trade of one portion of its citizens and allows it to be sold to other citizens? Is it desirable to maintain a great meat inspection service which simply takes the unwholesome meat from certain channels of trade and throws it into other channels? A service conducted in that way must soon become a byword and a reproach to our citizens, and a reflection upon our intelligence as a nation.

The Department has in the past prevented the sale, even for the local trade, of the condemned carcasses of animals slaughtered in abattoirs where inspection existed. It has done this by regulations not specifically authorized by the law, and by threatening to use its power to expose those firms which would deal in that class of meat. As the

inspection is extended, however, firms with less reputation and those more unscrupulous are involved, and it is becoming more and more difficult to protect the consumers.

NEED OF ADDITIONAL LEGISLATION.

The facts above referred to indicate conclusively that more power is needed for the proper administration of the meat-inspection service. It is not a question of destroying property. The condemned meat need not be destroyed, but the owners should be compelled to use it in a legitimate manner, viz, in the manufacture of fertilizers and grease. It is not proper for use as human food and it can not be sold for that purpose, unless this is done fraudulently. To saturate such meat with a nauseous compound like carbolic acid, which would enable anyone to detect it at once, would not detract from its intrinsic value, but would prevent its fraudulent sale. The same may be said of action requiring it to be immediately rendered into fertilizer or other similar products. There is in my opinion no good reason for allowing compensation in such cases, as the owner obtains all that the carcass is actually worth. In addition to authorization for the Department to require the proper disposition of condemned meat there should be a penalty for failure to dispose of it according to the Department regulations.

I would, in addition, suggest that a section be added to the law prohibiting, in the absence of the inspector, the operation of abattoirs where inspection is maintained; and also providing that such abattoirs should be closed on Sunday. These requirements are necessary to prevent uninspected meat from becoming mixed with that which has been inspected. There are some abattoirs which have shown a disposition to kill animals at night, or very early in the morning, or on Sunday, without notifying the inspector. It is hardly necessary to add that any animals which it is desired for any reason to prevent the inspector from seeing at the time of slaughter may be disposed of when the plant is operated at such irregular hours.

The desirability of allowing the members of the inspection force to have their Sundays free from the duties and cares of this responsible and arduous service, except possibly in cases of great emergency, is certainly too apparent to need argument.

Finally, I would urge the addition of a section to this law prohibiting the importation of the meat or meat products of any of the domesticated animals for consumption in the United States unless the animals from which it originated have been inspected by the government of the country in which the slaughtering was conducted, and unless the meat is accompanied by a certificate of inspection showing that the animals were free from disease and the meat sound and wholesome. Such a provision is required to protect the health of the people of the United States. We have now a great meat inspection service to protect our citizens from diseased and unwholesome meat prepared from animals slaughtered in this country, but an abattoir in Canada may ship to our markets the meat of all their diseased animals, and we have no means of protection.

In the same way trichinous hams may be shipped here from Germany, or bologna sausage from Belgium or other countries, where it is asserted they are made from the flesh of diseased horses and other refuse meat.

It can hardly be considered as otherwise than absurd for this Government to maintain such a rigid system of inspection for its domestic

meats and allow the meat products of the whole world to enter our markets freely without any inspection.

In making the estimates for the expenses of the Department of Agriculture during the fiscal year ending June 30, 1897, I recommend that the sum of \$800,000 be inserted for the salaries and expenses of this Bureau, and \$12,000 for the maintenance of the quarantine stations for neat cattle. These sums are the same as were appropriated for the current fiscal year, and notwithstanding the rapid development of the meat-inspection service will, I believe, be ample.

The country continues free from contagious pleuro-pneumonia. The efficiency of the stock-yards inspection and the large number of cattle examined at time of slaughter permits this statement to be made in the most emphatic manner.

The following tables are appended to show the rapid development of the meat-inspection service and the exportation of microscopically inspected pork:

Table showing the number of animals inspected at time of slaughter, by fiscal years.

	1891.	1892.	1893.	1894.	1895.
Beef cattle	83, 891	3, 167, 009	3, 922, 174	3, 862, 111	3, 752, 111
Calves		57, 089	92, 947	96, 331	109, 641
Sheep		583, 361	870, 512	1, 020, 764	1, 137, 300
Hogs				7, 964, 850	13, 576, 917
Total	83, 891	3, 809, 459	4, 885, 633	12, 944, 056	18, 575, 969

Table showing exports of microscopically inspected pork, by fiscal years.

	1892.	1893.	1894.	1895.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
To countries requiring inspection	22, 025, 698	8, 059, 758	18, 845, 119	39, 355, 230
To countries not requiring inspection	16, 127, 176	12, 617, 652	16, 592, 818	5, 739, 368
Total	38, 152, 874	20, 677, 410	35, 437, 937	45, 094, 598

REPORT OF THE STATISTICIAN.

SIR: I have the honor to transmit herewith my report for the fiscal year ending June 30, 1895.

Respectfully,

HENRY A. ROBINSON,
Statistician.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE DIVISION.

The work of the Division of Statistics consists primarily in collecting through the statistical correspondents of the Department, and afterwards preparing for publication, information as to the condition of the principal crops of the country throughout the growing season; as to the area under each crop, and at the close of the season its yield per acre and total product; as to the average date of seeding in the different States; as to the farm values of different products; as to the quantities of wheat, corn, and cotton remaining in farmers' or planters' hands at certain dates, and various other points. Another regular subject of inquiry is that of freight rates on the principal lines of transportation, the information on this being obtained directly from the carriers themselves and published in the monthly reports of the Statistician.

When the present Statistician entered upon his duties, wheat, corn, and oats were the only crops on which detailed estimates as to area, product, and value were published. Such estimates had been published for certain other crops for a number of years prior to 1889, but from that year to 1892, inclusive, they had been omitted. The estimates as to rye, barley, buckwheat, tobacco, potatoes, and hay, resumed in 1893, were continued in 1894. In the latter year questions in regard to rice were included in the circulars sent out to correspondents during the months when that crop was growing, and condition was reported from month to month, but the returns on area and product were not sufficiently full and satisfactory to warrant an attempt to make an exact estimate on these points.

STATISTICS OF THE COTTON CROP.

During the fiscal year under review an effort was made to devote to the cotton crop an amount of care and attention more nearly commensurate with its great national importance than it had ever before received.

The preliminary results of the investigation in relation to the cotton crop of 1894 were published in the Report of the Statistician for January-February, 1895. In September, 1894, the Department solicited the cooperation of all the railway and water transportation companies operating in the cotton-growing States, with a view to collecting trustworthy statistics as to the crop of 1894 before the opening of the season for the crop of 1895, so that planters might have the advantage of an assistance which this information could render them in determining what breadth of land it might be well to devote to this crop.

To the courtesy and promptness of the Southern transportation companies the Department is indebted for most of the material upon which its estimate was based. Acknowledgments are also due to the Southern cotton mills, which, with remarkably few exceptions, furnished the information requested of them, while over three thousand cotton buyers, merchants, and ginnermen are entitled to thanks for assistance voluntarily rendered. Reports were also received, through the courtesy of the Secretary of the Treasury, from all the custom-houses within the limits of the cotton-growing States.

The Department was thus enabled to obtain the data from which to compute the number of bales of cotton in each cotton-growing State that were moved by railway or by water from September 1, 1894, to January 1, 1895; the number bought by mills between the same dates, and the number remaining on plantations and in interior towns at the date last named. These three items together, assuming each to have been exact, would have given the total crop of 1894, plus any cotton that may have been held on plantations and interior towns on September 1, 1894. The last item of the three, that in relation to the number of bales remaining on plantations and in interior towns on January 1, 1895, was the one on which it was most difficult to obtain exact information, since this amount could, in the nature of the case, only be roughly estimated; and it was for this reason, chiefly, that the total obtained by this investigation and published in the Report of the Statistician for January-February, 1895, could only be regarded as preliminary.

A great improvement will, however, be made in this branch of the investigation in collecting the statistics for the crop of 1895. Instead of relying upon from one to a half dozen correspondents or agents to make the estimates for an entire county, each county will be subdivided into civil districts or townships and an agent appointed in each who will make estimates for his own locality or township, thus insuring greater accuracy.

The importance of the preliminary investigation arose chiefly from the fact that its results were made known to the planters some months before they began seeding for the crop of 1895. The fact that the cotton States had produced the largest crop in their history, which was disclosed by the figures of the Department, placed in a strong light the connection between low prices and excess of supply, and the timely knowledge of it which these figures furnished had probably much to do with the marked reduction apparent in this year's acreage, a reduction of from 15 to 20 per cent as compared with the acreage of 1894.

The information published in the same report as to the proportion of the crop forwarded to market up to February 1, 1895, expressed as a percentage of the total, both by States and for the whole cotton-growing region, and that relating to quality of the crop, dates at which picking closed in the several States, losses from insects and proportion of lint to seed was obtained through the statistical correspondents of

the Department, to whom a circular on these and certain other points is regularly addressed in January of each year, and made returnable on February 1.

The final estimate on the cotton crop of 1894 was published in the report of the Statistician for May, 1895. It embraced the results of an investigation as to the number of bales carried by each railway and water transportation company between September, 1, 1894, and April 1, 1895, from all parts of the cotton-growing States to the ports, to northern and eastern points, and to other destinations, as to the quantities bought for consumption between the same dates by mills in operation in the South, and as to the quantities remaining on plantations and in interior towns on April 1, 1895. The results of this later investigation indicated that the quantities remaining on the plantations and in interior towns on January 1, 1895, had been underestimated, the grand total being 9,476,435 bales, as against a total of 9,088,000 bales obtained as the result of the earlier investigation. The purchases by Southern mills during the seven months in question amounted to 646,128 bales, or over 6.8 per cent of the crop. Another interesting result of the investigation was to show the distribution of the crop of each State, so far at least as to trace the bulk of it to the ports from which it was shipped (either coastwise or to foreign countries), or to the principal inland markets in which it was disposed of.

The facts ascertained through this later investigation were obtained from substantially the same sources as those supplied by the earlier one, namely, the railway and water transportation companies, the cotton mills of the South, cotton buyers, merchants, and ginneries, and the special agents of the Department in the various cotton-producing counties.

The only investigations in regard to the cotton crops of particular States, other than that of the Department of Agriculture, were made by O. S. Young and H. G. Hester, secretaries of the cotton exchanges of Galveston and New Orleans, respectively; and these covered only the crops of Texas, Indian Territory, and Oklahoma. In the following statement the results reached by these investigators are presented in comparison with those arrived at by the Department of Agriculture:

States and Territories.	Department's estimate.	O. S. Young's estimate.	H. G. Hester's estimate.
	<i>Bales.</i>	<i>Bales.</i>	<i>Bales.</i>
Texas	3, 073, 821	3, 114, 826	.....
Indian Territory	104, 887	} 104, 467	.....
Oklahoma	13, 001		.....
Total	3, 191, 709	3, 219, 293	3, 276, 000

It is believed that the Department had much better facilities for obtaining these statistics than either of the above authorities, and that much of the excess shown by their figures can be traced to duplications. The difference between the results is, however, very small, when we consider the magnitude of the totals.

To aid in making the statistics of this important crop as full and accurate as possible, a special agent was appointed, whose acquaintance with cotton growing and the cotton trade would enable him to take advantage of the various sources from which trustworthy information could be obtained. The gentleman employed in this capacity is Mr. James L. Watkins, of Alabama.

REGULAR ANNUAL INQUIRIES.

On a number of subjects, aside from those connected with the condition and produce of the crops and the areas on which they are grown, inquiries are regularly made once a year and the results prepared and published. These received the usual attention during the fiscal year under review. Among them may be mentioned the average weight of wool per fleece; the number of stock hogs on hand for fattening on September 1, 1894, with their average condition as to weight and size and the diseases by which their condition had been affected; the number and value of the principal species of farm animals, with their prices on farms and ranches in January, 1895; the quantities of corn and wheat in farmers' hands on March 1, 1895, with the quantities retained for consumption in the counties where grown, the quantities shipped beyond county lines, the proportions of merchantable and unmerchantable corn, with the average home value of each; the quality of wheat as compared with an average, the estimated weight of wheat per bushel, and the proportion of the wheat on hand grown previous to 1894; the condition of farm animals on April 1, 1895, with the numbers, respectively, of cattle and sheep lost by winter exposure and by all causes during the twelve months ending at that date, and the numbers, respectively, of horses and swine lost by disease during the same period.

Another annual inquiry relates to the health of the people during the year ending April 1, with the diseases that have been most prevalent. This inquiry was made for the year ending April 1, 1895, in accordance with previous custom. Although somewhat outside of the usual line of work done by the Division of Statistics, the collection of information on this subject is conveniently accomplished in connection with other work; and as the information relates more especially to the health of the agricultural population (since it does not include the health of the city populations) it bears upon one of the most important of the conditions of agricultural prosperity. There is urgent need in the United States for increased attention to vital statistics both in town and country; and while something more precise than can be obtained through the statistical correspondents of the Department of Agriculture is much to be desired, it is not at present provided, and until it is, the collection of the information referred to may, no doubt, be usefully continued.

TRANSPORTATION RATES.

The study of the freight charges imposed by common carriers engaged in transporting the principal products of agriculture via rail, river, lake, and ocean, from the regions of surplus production to those of consumption, has been continued during the year and extended so as to include the principal commodities by which the farmer is compensated.

The terms of their charges have been received monthly from officials of most of the great transportation lines, and these have been supplemented by brief textual explanations of the manner of adjusting charges from competing sources of supply to their common markets, with the resulting relations which, when thoroughly understood, allow one rate between important points to stand for those upon similar articles between thousands of stations.

The dissemination of accurate information upon these subjects is believed to be of great educational value, and may, it is hoped, assist in

bringing to the determination of the great problems a calm and enlightened judgment that will inevitably result in their final and satisfactory solution.

STATISTICS OF PRICES.

The collection of information as to the wholesale prices of agricultural products at a number of our leading cities is a regular and important part of the work of the office. The importance of authentic records of prices, covering considerable periods of time, is constantly making itself felt in connection with the economic discussions of the day, and the collection and preservation of authentic data in regard to the prices of agricultural products in our principal markets is a manifestly appropriate function for an office that exists for the collection of agricultural statistics.

In addition to the statistics of farm prices of cereals, potatoes, sweet potatoes, hay, cotton, and leaf tobacco published in the report of the Statistician for December, 1894, the same number of that report contained a table of wholesale prices of the principal agricultural products at leading cities in all sections of the United States from the lakes to the Gulf of Mexico and from New England to the Pacific Coast. A similar table, but for different dates, was published in the report for March, 1895, and in the same number appeared an article reviewing the course of prices for wheat from 1865 to 1894, inclusive, with tables giving the farm values by States and the prices in some of our principal markets for the thirty years in question.

Another article on the prices of wheat appeared in the report of the Statistician for May, 1895, the prices reviewed in this case being those of the English markets, the period covered embracing the one hundred years ending with 1894. In this article the prices of wheat since 1846 were compared with the general average of prices for a list of forty-five articles embraced in the well-known tables of Mr. Augustus Sauerbeck, the fact being shown that the decline in wheat had been much greater than the decline of prices in general, as indicated by the articles in Sauerbeck's list; and a reason for this difference being found in the fact that wheat "is one of the commodities whose production and transportation have been most largely cheapened by the progress of modern invention and mechanical improvement, coupled with the fact that vast regions in which land of great fertility could be had at a nominal figure were available for wheat growing as soon as the cheapening of transportation brought them within reach of the world's markets."

The subject of prices is included to some extent in other matter published during the year, while the tables on rates of transportation published from month to month through the year under review constitute, on a closely related matter, a detailed record which now extends over many years.

MISCELLANEOUS STATISTICAL MATTER.

In connection with the annual statistics of the crops published in the Report of the Statistician for December, 1894, the usual meteorological record of the season was prepared and was published in connection with a review of the conditions under which the leading crops were grown and by which their yield was affected.

Among special articles prepared and published during the fiscal year 1894-95 may be mentioned the following: "Production and consumption of rice in the United States;" "Commerce between the United

States and Mexico for 1873, 1878, 1883, 1888, and 1893;" "Urban population in the South;" "Rice production in the United States since 1720" (for which the statistical data were supplied by Messrs. Talmage—Dan Talmage's Sons—of New York, Charleston, etc.); "Consumption of wheat per capita in the United States" (a careful analysis of the figures on production and distribution since 1867, including, as to production, the returns of the last three censuses); "The wheat crop of the world for 1891, 1892, 1893, and 1894;" "Production, imports, and exports of potatoes since 1885," and the different articles on prices referred to above.

Tables on our imports and exports of agricultural products were compiled from the reports of the Bureau of Statistics (Treasury Department) on our foreign commerce, and tables comprising some of the more important results of the census of 1890 as regards our agriculture were compiled from the official reports of the Census Office.

STATISTICS OF FOREIGN AGRICULTURE.

Much information was published during the year in regard to the agriculture of foreign countries. The reports of the European agent of the Department were furnished regularly and published in the monthly reports of this office, the report for November, 1894, being the only one of those issued during the fiscal year which contained no communication from him. Another special agent furnished, among other matter, a report on the use of Indian corn in Germany, which appeared in the Statistician's report for October, 1894.

Other information on foreign agriculture and crops was furnished by consular and diplomatic officers of the United States and condensed for publication in the monthly reports of the office. Matter from these sources appeared in all but three of the numbers of the monthly report issued during the last fiscal year. Among the more important of the communications received may be mentioned a report on the crops of Argentina from the representative of the United States at Buenos Ayres; one on the same subject from our consul at the same city, and a report on the production of corn, potatoes, legumes, rice, and fresh fruit in Italy from 1889 to 1893, inclusive, with the imports and exports of these products for the same years, from Consul-General Wallace S. Jones.

For the final and corrected statistics of foreign crops the best sources of information are to be found in the statistical publications of the various foreign governments. The compilation of tables from these publications and the reduction of the foreign denominations of area, capacity, weight, and value to their American equivalents have always called for a considerable amount of expert work and continued to do so during the fiscal year under review. There is also a considerable amount of computation incidental to this work, which, though not requiring the skill of experts—since it is done under direction—calls for a high degree of care and accuracy, as well as celerity of performance. Much of the work done in connection with statistics of foreign agriculture would have to be performed in compliance with requests for information, even were it never printed, such requests, during the sessions of Congress, coming chiefly from members of both Houses of that body.

ANSWERS TO INQUIRIES.

The requests for statistical information coming from Senators, Representatives, and others cover a wide range of topics, domestic and foreign, and the preparation of replies in many cases necessitates considerable research, often including the examination of official documents in several languages. In determining the amount of labor to devote to the answering of inquiries regard is had to the public importance of the information sought, and where a laborious investigation seems justified from this point of view, it is usually found practicable to give its results a much wider range of utility than would be secured by using them only in replying to the inquiry of one individual.

Tables are now being compiled showing, by States and years, the production and value of the principal crops and the number and value of farm animals in the United States for the entire period covered by the investigations of this Department, and when completed they will materially facilitate the work of answering inquiries.

CATALOGUING, INDEXING, ETC.

The work of cataloguing and arranging the library, which consists of about 7,500 volumes and files of 125 agricultural and commercial newspapers and periodicals, is rapidly being completed, and the indexing of materials of statistical value found in the French publications has been carried on during the year and might with advantage be extended to publications in other languages, if the force of the office were adequate.

STATISTICS OF WHEAT DISTRIBUTION.

It is the aim of the division to organize all possible sources of information whereby the distribution as well as the production of the principal cereals may be determined with increased accuracy. The insertion in the circular dated June 1 of a question in relation to the quantity of old wheat on hand on July 1 is noticed below, and efforts are being made to obtain trustworthy information as to stocks in elevators and elsewhere.

Under date of January 25, 1895, a circular was addressed to millers throughout the United States, so far as their addresses could be obtained, making inquiry as to the quantities of wheat ground in their respective mills from February 1 to August 1, 1894, and from August 1, 1894, to February 1, 1895, distinguishing between that which was ground for flour and such, if any, as was ground for feed. Another inquiry in the same circular was intended to ascertain the quantity of wheat in millers' hands on February 1, 1895, separately, that in their mills, and any wheat belonging to them which may have been stored elsewhere, or which may have been in transitu on the date named.

Another circular bearing the same date was addressed to individuals and corporations owning elevators, and contained inquiries as to the quantities of wheat and flour, respectively, in their respective elevators on February 1, 1895.

The replies to these two circulars are believed to represent numerically about 25 per cent of the mills and elevators of the United States, and as those heard from include the larger concerns, they, of course, represent a much larger proportion of the business done by the mills and elevators of the country as regards wheat. An effort is in progress,

however, to make the Department's list of such establishments complete, and to secure the cooperation of all their proprietors in furnishing the desired statistics. A circular dated April 15, 1895, has been widely distributed in furtherance of this object, and the number of replies thus far received is believed to represent about 65 per cent of the mills and elevators of the United States, including establishments handling fully 80 per cent of the business done in their respective lines. The circular of April 15 is especially directed to completing the list of establishments, and obtaining the consent of their proprietors or managers to act as correspondents of the Department, the collection of the desired statistics being postponed until the list shall have been made as full as practicable.

An investigation as to the average consumption of wheat per capita is a part of the work in contemplation, and inquiries will be made in regard to the quantities of winter and spring wheat respectively that are used for seed. In regard to the average consumption of wheat per capita there has been much dogmatic assertion, but evidence of definite knowledge is wanting. Deductions have been made on this subject by taking the Department figures on production in connection with available data on distribution; but, if we except the figures on exports, the data on distribution lack the degree of certainty that would justify their treatment as known quantities that can legitimately be used in determining the unknown quantity consumed as food.

ANALYSIS OF THE RETURNS TO AGRICULTURE.

An investigation was begun in February, 1895, having for its object to determine from data furnished by the last census, and obtained from various other sources, the proportions in which the net farm value of agricultural produce is divided between the three factors of production, labor (including mental with manual labor), capital, and land. If the necessary data can be obtained in sufficient completeness and differentiated with sufficient distinctness to show the distribution between these factors, the results of the study that is in progress will be of great interest from an economic point of view. The investigation is, however, attended with peculiar difficulties, one of the most formidable of which is that of determining what part of the total income from agricultural industry is to be regarded as compensation for the farmer's own efforts, including the skill and judgment displayed by him as a manager, and what to the advantages in the way of fertility, convenience to market, etc., attached to the land he cultivates.

The part which is to be regarded as compensation for his capital (other than the investment in his land) is approximated by considering the average rate of interest on money lent on mortgage security in the different States, though even on this point an approximation is all that can be expected. The knowledge sought would, however, be so valuable, if satisfactorily attained, that the attempt to attain it seems well worth an effort; and if it shall be found that the data now collected through the census and other agencies are not of a character or in a form to lend themselves to a satisfactory solution of the problem in question, the experience gained may at least aid in showing precisely the information which is wanting, and suggesting a means of securing it. The main difficulty will undoubtedly be that of making a clear division between that part of the net return which is known as "rent" in the economic sense of that word, and that which is economically classed as "profits"—that is, it will be the difficulty of distinguishing

between the income obtained as a result of the possession of land, independent of its improvements, and that obtained as the result of management, over and above the ordinary returns to wage labor.

INCREASING AMOUNT OF WORK.

A material increase in the work of the division began during the latter months of the year, and there will be a continued increase in the demand for labor during the next year. This is due partly to the new plan for the collection of statistics of cotton production, which already utilizes the services of about 3,500 correspondents distributed throughout the cotton States. Communication must be had with these correspondents several times a year, the returns tabulated, and, in addition to this, various publications of the Department are sent to them.

Another source of increased demand upon the resources of the division is the new plan for collecting statistics of wheat production by means of reports from millers and proprietors of elevators. Already about 15,000 correspondents have signified their willingness to make reports in regard to wheat, and when it becomes possible to make the list as complete as it should be, many thousand more will be added. Communication is to be had with these correspondents also, the returns tabulated, and various publications sent to them.

The largest new demand upon the resources of the division, however, is coming from the plan of crop reporting by township correspondents. There are about 35,000 townships in the United States, and if they are suitably represented by correspondents to carry out the plan as it has been contemplated, the labor of corresponding with them monthly, of tabulating their reports, and of sending them publications, will be an undertaking of much greater magnitude than any single undertaking now carried on by the division.

For the foregoing three reasons, the requirements of the work to be done are already more than equaling the power of this division to meet, and in the immediate future will far exceed that power. A material increase in the number of clerks employed is necessary if the regular work heretofore done is to be continued, and if, also, the special undertakings above mentioned are to be prosecuted with any hope of success.

In obtaining returns from correspondents, and in distributing reports throughout the United States and in foreign countries, the use of the mails has grown to large proportions. The synopsis of the monthly crop report has been sent to about 121,700 persons—a total of about 1,460,400 copies for the year, and the full report has gone to nearly 20,000 persons—a total of nearly 240,000 copies, during the year. Over 16,500 crop-reporting circulars have been sent to over 2,300 addresses of State and county correspondents monthly, making for the year nearly 200,000 circulars to 27,600 addresses, and a large percentage of these circulars were returned to supervising correspondents and to the office with reports. Cotton reporting has necessitated circulars for returns from about 26,800 addresses during the year, duplicates being counted, and of this number the returns were a large percentage. Besides this, 8,000 reports have been sent to cotton correspondents. In the preparation of the plan for reporting wheat production through millers and proprietors of elevators, circulars have been sent to about 90,000 addresses. The distribution of various reports, in addition to those mentioned, approximated 50,000 copies. In all, the circulars used in crop reporting and the reports distributed amounted to upward of 2,000,000.

CORRESPONDENCE.

There were received and recorded between June 30, 1894, and July 1, 1895, 4,044 letters requiring answers, and there were sent out 5,014 letters. Of the outgoing mail, 1,687 pieces were classed as general correspondence; 838 pertained to the work of the county correspondents; 646 to cotton statistics; and 1,843 to State agents and freight-rate work. The work done in connection with this correspondence includes recording, sorting, and referring of letters received; the press-copying and dispatching of all outgoing matter; indexing; and filing of all letters received.

The above statement of mail received is exclusive of circular and other unrecorded matter.

The work of correcting and revising the synopsis and other minor mailing lists has been prosecuted as opportunity permitted, and the additions have been if anything more numerous than usual. The demand for the monthly crop reports seems to be increasing.

BOARDS OF TRADE CONFERENCE.

When the National Board of Trade met in Washington in January, "a committee was appointed to confer with the Secretary of Agriculture and the Statistician with a view to improving the present system of agricultural reports, so that they should become more complete and reliable as a basis of information concerning the growing and harvested agricultural staples of the United States." This committee, after consultation with the Secretary, being so empowered, issued a call for "a conference with his Department by representatives of the leading commercial bodies of the United States actively engaged in handling agricultural products," to be held in Washington April 15. The conference met accordingly, in the rooms of the Interstate Commerce Commission, and by adjournment in the library of this Department, prominent commercial organizations in New York, Philadelphia, Baltimore, Cincinnati, Shelby, Toledo, Detroit, Chicago, Quincy, St. Louis, and Minneapolis being represented by delegates. A minute inquiry into the present methods of the division, and also the methods of crop reporting in several European countries, was made, the Statistician furnishing a written statement and submitting to a wide range of questions. Discussion of an annual agricultural census, and of the qualifications of county bankers and assessors as crop correspondents, revealed wide differences of opinion. Papers by various delegates, making a number of suggestions for improvements and supposed improvements, were read and canvassed, with the final result that a committee of five was selected to "summarize the salient features and ideas that had been presented at this conference and give them to the public." That committee subsequently made a report, which after a full discussion was with a few amendments adopted by the entire conference, as follows:

RESOLUTIONS OF THE CONFERENCE ON AGRICULTURAL REPORTS.

This conference, called to consider means by which the crop-reporting service of the Department of Agriculture may be improved and the official results made more satisfactory to the public, beg to submit for the consideration of the honorable Secretary of Agriculture the following suggestions:

That it is the judgment of the interests represented in this conference that the official crop-reporting service should be maintained, and that the reports now regularly issued be continued, with such modifications as hereinafter suggested.

(1) That the April report on winter grain be discontinued, but that all other features now embodied in that report be continued.

(2) That in all reports concerning acreage of the various crops reported upon, the Department give the area by States in acres, as well as by the percentage of the previous year's area.

(3) That the Department, instead of having a principal correspondent and three assistants in each county, as at present, make an effort to secure the regular service of one or more reporters in each township, all to make their reports directly to the Department at Washington.

(4) That in the selection of these correspondents they should not be taken from farming classes exclusively, but should include, so far as possible, representatives of all classes of rural industry.

(5) That the Department discontinue the employment of salaried State agents in the regular crop-reporting work.

(6) That the returns of reserves of wheat, corn, oats, and cotton be had for dates representing the close of the crop year; wheat on July 1, oats on August 1, corn on November 1, and cotton on September 1.

(7) That arrangements be perfected with the United States consular service for sending by cable to the Department, on or about the 9th of each month, a statement giving the best available information concerning prospects for crops of grain and cotton in their respective districts, to be published in connection with the domestic crop report when issued.

(8) That it is the sense of this conference that a law should be enacted punishing by fine and imprisonment any employee of the Department of Agriculture who divulges to any one outside of the Department of Agriculture any statistical or other general information of the Department previous to the time appointed for officially presenting the same to the public.

ACTION ON SUGGESTIONS BY THE CONFERENCE.

The most important of these modifications was the third, and steps were promptly taken by the division to carry out this recommendation. A circular letter was sent to the county officers in all the counties of twenty States (specially selected because in them is grown more than 90 per cent of the country's wheat crop) requesting the nomination of two or more residents of each township, so that the Department might "communicate directly with the second person named should the first be found unavailable." A large majority of those officers obligingly sent names as requested, and the Statistician at once addressed the nominees, of whom several hundred had already accepted the post of township correspondent by the 1st of July, at which date large numbers of acceptances were arriving by every day's mail. As fast as those acceptances came, the new correspondents were requested to furnish crop reports for their townships in the same form as the county correspondents. The progress of the work of township organization in these and other States, the assistance rendered by the new correspondents to the monthly crop reports of the Department, and the improvement in accuracy that may be realized from them, will form an important part of next year's report.

In the line of the fourth suggested modification, a part of the circular addressed to county officers may be quoted: "It is not desirable to limit the names submitted to farmers exclusively. No doubt millers, physicians, grocers, and others may be found well qualified for the purpose." In the blank accompanying the circular, these officers were requested to state the occupation of their nominees; and while the majority of names returned appear to be of farmers, there is a wide diversity of callings among them.

The aid of salaried State agents has not been given up, for their reports are often found useful and sometimes invaluable in supplying deficiencies and detecting errors in those of the county correspondents. But in the belief that a considerable economy in the cost of this service could be easily and advantageously introduced, it has been decided to

cut down the number of these agents, selecting the most efficient of them for retention. The present fiscal year will show, it is hoped, better work from fewer men.

In the inquiries of the July monthly circular, a question as to stocks of old wheat in farmers' hands was added. It is intended to make the other inquiries recommended in the sixth suggestion as the dates for them come around.

The work of the division in the line of the remaining suggestions will be reported next year. The last, however, is addressed to the national law-making power rather than to the Department, and the Department can not fairly be expected to urge the enactment called for, though altogether in unison with its purpose.

COUNTY STATISTICAL CORRESPONDENTS.

In the States where reporting by townships has not been brought to a smoothly running system, and in the States not yet organized for the purpose, the dependence of the Statistician must be, in the future as in the past, mainly upon the trained force of county correspondents. What the crop-reporting service owes to the zeal and industry of these unpaid assistants, how intelligently and faithfully they usually discharge their onerous duties, it is always a pleasure to bear testimony. In order to make their work more valuable to the Department and the public, the Statistician has endeavored to give them instructions and exercises in precision of thought and expression, where opportunity presented itself. The hints and directions which have for years appeared in the monthly circulars would, it was thought, be of better service if collected, fused into a whole and systematized, and improved by some additions. The result was a pamphlet *Manual of Instructions to Crop Correspondents*, printed in April, a copy of which has been sent to every reporter for the division. The scope of the questions in the circulars has also been extended. In past years correspondents have sometimes been asked to estimate the "prospective yield" per acre of an important crop; this has now been made the rule for all leading staples, and along with his prospective yield the correspondent has been asked also to give the "normal" or full yield of the crop in his county, so that the knowledge of what product per acre corresponds to the condition he calls 100 might be a check on the condition figure actually furnished by him. That the normal yields of different parts of the country, when combined into an average for the whole country, would give a very definite and approximately constant quantity, was shown in 1892 in a computation by the then Statistician; and it is believed that if the reporter is again and again confronted with the question of how many bushels or pounds per acre his 100 of condition means for him, his figures for "normal" yield will come to be of important service in giving the reports of the Department a more definite and practical character.

During the fiscal year under review the number of resignations on the part of county correspondents was much larger than in years past, owing chiefly to dissatisfaction at the withholding of the postage stamps formerly allowed them. The vacancies thus created have, however, been filled in most cases, and the corps is therefore almost as strong in point of numbers as it was a year ago. It is worthy of consideration whether the Department may not be able to recognize in some more specific way than heretofore the services of its faithful correspondents, as, for example, by the conferring of formal acknowledgments for length

and efficiency of service, something like the diplomas conferred by an institution of learning. Their requests for documents, or for anything which the Department has for distribution, should, of course, receive prompt and cheerful attention, and in every other way possible they should be made to realize the high estimation in which their services are held.

THE STATE AGENTS.

Great efforts have been made during the past year to bring to a higher state of efficiency that part of the office force which has been in charge of agents appointed to cover separate States. Experience having indicated the practicability of consolidating two or more States under one agent without any impairment of the service rendered, such a course, as noted elsewhere, has been adopted. This resulted in a saving of about one-third of the amount formerly paid out to maintain this service, and permitted an increase in the salaries of the most deserving agents. Further experience seems to have amply demonstrated the wisdom of the change. Better results are now secured than at any time in the past, and there is a constant tendency toward a higher plane of efficiency.

This tendency will no doubt be still further promoted by the application of the system of competitive examinations to this branch of the service and by your own policy of making efficient service the sole condition of permanency in the tenure of office.

A function which might with advantage be assigned to the State agents if their salaries were made commensurate with the time its performance would require is that of exercising an active supervision over the work of the statistical correspondents. If such an arrangement were made it would become their duty to visit from time to time the various counties within their respective districts, observe for themselves the agricultural conditions prevailing therein, inquire as to the normal yield of each of the principal crops, form their own opinion as to this and other points of interest in connection with the duty of crop reporting, confer with the correspondent and his assistants and report as to their apparent competence and interest in their work, and if necessary suggest the names of more suitable men whose services as correspondents they might find to be obtainable.

In their conferences with correspondents and their assistants the agents would give any instructions and suggestions likely to be useful in increasing the efficiency of their service and securing uniformity of method among the correspondents of their respective districts. They would endeavor to ascertain the extent of the effort made by each correspondent to obtain the information on which to base his reports from month to month, and especially those reports which furnish the data for the annual crop estimates of the Statistician, and for the annual statements as to number and condition of farm animals, quantities of wheat and corn in farmers' hands, etc. They would also inquire as to the method adopted by correspondents in making their various estimates, and by comparison would become acquainted with the differences between these methods, and would be able to call the attention of all the correspondents in their respective districts to any method which might seem to them to have superior merit.

Not only would each agent have opportunity to become acquainted with the best methods in use in his own district, but the whole body of them could meet together from time to time in Washington for comparison of views and experiences, and for conference with the Secretary of Agriculture, the Statistician, etc.

NEED OF BETTER ACREAGE RETURNS.

It may not unreasonably be hoped that by the use of returns on condition, and of returns at the same time on expected and standard yield, to serve as a check upon the others in the case of the more important crops, a higher degree of efficiency in the crop-reporting service may be attained, particularly after the township organization shall have been completed and the productive areas of the country more minutely and thoroughly canvassed. But the problem of acreage determination will still remain unsolved. With the means now at the command of the Department it has no choice but to continue as it began in estimating this vitally important factor; to base each year's return upon that of the year before, as it in its turn was based upon the one preceding it, and so on back to a census year; if the census determination was two, five, or ten per cent in error, to have every year's report two, five, or ten per cent in error in the same direction; if there was an error about any comparison of a year with the year before it, to have that error enter with full force, affected only by such other errors of similar kind as may come to be added to it, into every report till the decade is out. That these are real and not merely possible evils the wide divergence between the figures of this Department and those of the Tenth and Eleventh Censuses for crop areas bear too eloquent witness. The remedy for such evils has been nowhere better pointed out than in your own address of welcome to the Boards of Trade conference on the 15th of April:

Fully and perfectly I am aware of the many shortcomings of the methods heretofore employed by the Statistical Division of the Department of Agriculture. There are some fundamental fallacies in the methods which ought to be eradicated. These fallacies have existed from the time that this system was inaugurated. Principal, it seems to me, among these is the fact that the census acreage, for wheat for instance, is carried from one census year to another, the county being weighted for that amount of wheat, whether it may treble that amount or reduce it a third or two-thirds; and I can not for the life of me see, with that underlying fallacy, how you can approximate facts very readily or successfully. It seems to me that we ought to have a crop census. We can never approximate the facts as to the various crops until we do have that census. It has been objected to by many on the ground that it would be altogether too expensive. Some months ago I laid that subject before the President of the United States, and after a good deal of thought and deliberation he said that he believed that it was about the only way to arrive at the truth, or to approximate the truth, as to the various crops of this country. You are all aware of the fact that that is the method in the United Kingdom of Great Britain. My friend the Statistician, Mr. Henry A. Robinson, suggested that plan last year, and he also suggested that he thought it could be inaugurated and perhaps carried out at an expense of \$500,000 per annum. That is declared to be by many too small a sum of money. But admitting that it would cost three times that, if we are in pursuit of truth and desire to arrive at the facts or approximate the realities in the case, \$1,500,000 is not too much to expend in regard to this one avocation of mankind upon which all other avocations depend.

AN AGRICULTURAL CENSUS.

However valuable the results which may be attained by efforts to improve and perfect the present system, they can never possess the degree of certainty which would attach to the returns obtained by the census method, especially if the latter were perfected as it would be if the census of agriculture were taken every year; and nothing less than this degree of certainty ought to be accepted as the final aim of endeavor in this particular field of statistical work.

For the population and wealth of the country and various other matters dealt with in the decennial censuses a return once in ten years may

be sufficient. The statistics of population are supplemented by annual records of immigration, and the figures on this subject, coupled with estimates based on the laws of natural increase fairly deducible from the returns of successive censuses, afford a basis for a very close approximation to the total population of the country at any given time. As regards the population of particular States and cities, this, in many cases, is ascertained by the local authorities for points of time lying between the national enumerations. For many of our smaller industries a decennial return may be sufficient for all practical purposes. There are others in which a census once in five years or oftener is probably desirable, and certainly in the case of agriculture there is an undoubted demand for an annual ascertainment of the more important facts. The interest with which the statements published by the Department of Agriculture are looked for month after month and year after year affords a sufficient proof of the existence of this demand, and the criticisms to which these statements have always been subjected show that the demand is one which mere estimates can not satisfy, however broad the basis on which they rest. The system of township reports may command more confidence than has been reposed in the system heretofore in use, but it is not likely to be accepted as final, nor is it desirable that it should be.

The fact that agriculture (using the word in its broadest sense) is the great source not only of food products but of the greater part of the raw materials of industry, partly accounts for the exceptional interest with which its results are watched by the commercial world; but there is another circumstance that gives exceptional importance to precise and trustworthy information as to the results of agricultural activity for every season, namely, the uncertainty to which these results are liable on account of their large dependence on conditions entirely beyond the control of human skill. In a manufacturing industry the work that will be accomplished within a year by employing a given plant and a given number of operatives can be very accurately estimated, but in agriculture two farms of equal size and fertility, equally well equipped and equal also in the amounts and qualities of the labor employed upon them, may yield the most widely differing results solely on account of having been subjected to different conditions of weather. And while there is a vast difference between seasons, taking the country as a whole, so that the total crop of corn, wheat, or any other agricultural product may one year be very short and the next extremely abundant, there are, in either bad seasons or good ones, important local differences, due to weather and other local conditions. For such reasons as these a census of agricultural production taken only once in ten years can not be accepted as giving an accurate idea of the average annual produce of agriculture, either for the country as a whole or for the different sections or States thereof. The season may have been more or less exceptional in the census year; and if that is not true for the country as a whole, it is almost certain to be true for considerable parts of it.

DEFECTS OF THE DECENNIAL CENSUS.

In the case of agriculture, therefore, the results of a decennial census would be subject to a serious defect, however accurately they might give the facts of the particular year to which they referred. But it is an almost inevitable result of the decennial system that the censuses taken under it will be seriously wanting in accuracy, for the reason that the work of such a census, whether in the collection of its primary data

throughout the country or in their collation and consolidation in the Census Office at Washington, must be done in the main by untrained and inexperienced persons. A few of those engaged in the work of one census may be available, after a lapse of ten years, for the next, but it is a lucky chance if these are highly efficient. A capable employee who finds a place in some other branch of the Government service during the interval may again be available, but one who has been left to private opportunities for employment will probably not be tempted away by any ordinary position which the Census Office can offer. In this case the abler he is and the more desirable it is to secure his services the smaller is the chance that it will be possible to get him.

If, however, the statistics of agriculture were collected annually, and those of manufactures, mining, and fisheries as often, say, as once in five years, there would always exist a considerable body of persons possessing experience and skill in the different branches of statistical work, and the force necessary for the decennial census of population could be drawn largely from this source. Substantially all of the necessary directive work of the Census Office could, in fact, be thus put at once into experienced and competent hands, and the extra force which would have to be employed for the decennial work would fall promptly into line under suitable guidance, just as new recruits take their places in the ranks when the skeleton of an efficient military organization is already in existence.

In the work of taking a census and preparing its results for publication defects in the form of schedules, or in methods of operation, are often brought to light. If another census were taken in the succeeding year such experience would be promptly turned to account and the needed improvements made. But by breaking up the office at the conclusion of each census, no one, from the Superintendent down, knowing who are to have charge of the next, such lessons of experience must in most cases be lost.

That the census taken under present conditions is seriously defective is not, however, merely a conclusion reached by reasoning from the premises. It is, unfortunately, only too well established on the evidence of men familiar with the details of census work, to say nothing of the internal evidence sometimes furnished by the figures themselves, of which many examples could readily be adduced. The question of an annual census of agriculture, or at least of the more important facts of agricultural production, is therefore not merely a question of obtaining accurate statistics of agriculture more frequently than we now do. It is, on the contrary, a question of obtaining every year more accurate statistics than we can hope to obtain at all under the decennial system. From this point of view a quinquennial census of agriculture would be a material improvement on a decennial one, since it would aid in retaining a limited number of experts in permanent service, while the work of a biennial one might, perhaps, be so distributed as to give permanence to the larger part of the force employed, thus securing the benefit of expert work in quite a satisfactory degree. A biennial census, too, with estimates for the intermediate years, would no doubt go far toward registering the variations in the crops due to differences in the character of the seasons, although it might easily happen that a year of exceptional scarcity, or one of exceptional abundance, would fall in the interval between two censuses, and thus fail to have its crop results recorded. While an annual census of agriculture is most to be desired, a series of biennial ones would undoubtedly afford great advantages as compared with one taken only once in a decade.

SCOPE OF THE CENSUS.

It would be necessary to avoid attempting to make an annual or biennial census cover too wide a range of inquiry. The most important item would be that of crop areas. If these were known the estimates furnished by crop correspondents, in the form of condition as compared with a normal, and of actual bushels, etc., per acre as a check, would be capable of furnishing excellent results; but since area has no standard for comparison, and finds many ways of slipping beyond the grasp of the statistician for computing it, there is no dispensing in its case with the method by aggregation of particulars; and the more often this can be done the more often the facts can be known. The other agricultural data to be collected by the enumerators should be such as can be collected at the most advantageous time for the census of areas, and their collection should be held always subordinate to this leading object of the census.

While product of the principal crops, stocks of grain on hand, number of live stock, and, perhaps, some additional items could no doubt be obtained on the same schedules with areas and without any great addition to the cost that would be involved in collecting areas alone, it would be desirable to make the inquiries of an annual census as few and as direct and simple as practicable. One object to be gained by doing so would be to reduce to a minimum the difficulty of filling the schedules, so that after the system was once fairly under way a large proportion of our farmers might fairly be expected to fill out and return schedules sent to them by mail, thus greatly reducing the cost of the census work. Another would be to keep the work of examining, collating, and consolidating the returns within manageable proportions and reduce to a minimum the time required for its completion, while keeping the necessary office force, and consequently the necessary expense for this part of the work, within as narrow limits as would be compatible with its efficient performance.

Inquiries as to the quantities and values of minor products, as to the value of farms, the areas of improved and unimproved land, respectively, which the farms contain, the numbers and values of the more important kinds of agricultural implements in use, the total value of farm implements in general, and various other topics properly included in a complete agricultural census could be made as now once in a decade; or if it were found convenient to make them more frequently in connection with the annual censuses of the principal crops they might be made as often as once in five years. Various special investigations in relation to the economics of agriculture could be undertaken from time to time, such as inquiries into the causes of low prices in the case of certain important products, into the relation between prices received by the producer and those paid by the consumer, and into the comparative cost of production under different conditions and with agricultural equipments of different degrees of efficiency; or the full censuses of agriculture, whether taken once in ten years or oftener, could be made to embrace such inquiries; and an office which, like this, is constantly dealing with agricultural conditions and constantly in touch with the agricultural interests of the country, would be in a specially advantageous position for the framing of such schedules as would elicit information of real significance and value from an economic point of view.

It was pointed out in last year's report that for the work of taking an agricultural census the Department of Agriculture would possess a great initial advantage in having in its county correspondents a body

of men for the most part especially well qualified for the work of collecting the requisite information. This advantage has since been increased by the addition of the large body of township correspondents already referred to, and will be increased still further as their number receives further accessions. The taking of annual censuses would not obviate the necessity for the services which the statistical correspondents now render gratuitously in reporting crop conditions throughout the growing season, and the fact that they would receive a reasonable compensation for their share in the census work would afford them some encouragement in the gratuitous labors performed during the remainder of the year. It would also diminish the difficulty of finding in every agricultural township some competent person who would be willing to assume the task of making the gratuitous monthly crop reports.

COST OF THE CENSUS.

In last year's report it was suggested that an agricultural census, covering such inquiries as it would be desirable to make for annual purposes, could be taken—if not for the whole country, at least for the more important agricultural States or for selected agricultural counties—at an expense of \$500,000. It would doubtless be desirable, however, to make the census cover our whole agricultural territory; and to repeat what was justly said in your own address of welcome to the Boards of Trade conference of the 15th of April last, "If we are in pursuit of truth and desire to arrive at the facts or approximate the realities in the case, \$1,500,000 is not too much to expend in regard to this one avocation of mankind upon which all the other avocations depend." Indeed, an expense of \$2,000,000, should so much prove to be necessary, ought not to be considered a fatal objection to the undertaking. And whatever might be the expense at the start, there is good reason to believe that it would rapidly diminish after the first year. Not only would the men employed in collecting the information and the force employed here in the Statistical Division gain skill and efficiency through experience, but the farmers themselves would learn just what information was expected of them and would prepare themselves to furnish it. It would become habitual with them to notice those points in their business about which they were asked from year to year in the census schedules, and no good reason is apparent why a large proportion of them could not soon be depended upon to fill up and return schedules sent to them by mail, thus saving a large part of the labor and expense incident to a farm-to-farm visitation. In many counties or townships the paid labors of the statistical correspondent in the distributing, filling up, and collecting of schedules might thus be reduced within very narrow limits. It would be only in districts having a more than ordinarily illiterate population that a complete farm-to-farm visitation would be permanently necessary.

In brief it may be said, largely in repetition of what was said on the same subject in last year's report, that the use and value of the statistics now published are the best evidence of the greater use and value of data that would be free, and by their mode of collection would be known to be free, from the errors, or, at best, the want of certainty, necessarily inherent in those which the Department can collect with its present facilities; that a frequent census of agriculture, preferably an annual one, so far as regards the more important facts of agricultural production, is the only means by which data possessing the desired accuracy and certainty can be obtained; that the cost of their collec-

tion would be amply repaid to the public by the higher character of the results achieved; that these results would be a great improvement, not merely on the estimates now made by the Statistician of the Department of Agriculture, but upon any statistics which can possibly be collected by a census office organized once in ten years for the taking of a single census, having but a transitory existence and operated by a force whose tenure of office is for the most part still more transitory; that the value of the results would be certain to increase from year to year, while the cost of obtaining them could be made to diminish; and, finally, that the time required to summarize and publish the facts collected would, through the skill, experience, and perfect organization gained in connection with annual censuses, be reduced to a minimum, thus enhancing the value of the results attained by assuring promptness in their publication.

APPOINTMENTS BY COMPETITIVE EXAMINATION.

In your last annual report it was stated that the Secretary of Agriculture had called for examinations before the United States Civil Service Commission for the purpose of filling the then existing vacancy in the office of assistant statistician and also selecting chiefs of sections. These examinations were held, and the Department as well as the Commission may fairly be congratulated on the results. The two examinations were held together, occupying two days, namely, the 15th and 16th of January, 1895. They were especially designed to ascertain the fitness of the candidates for the important duties of the positions to be filled, being for the most part, besides the personal questions tending to show, among other things, their previous training and experience, a test of the sufficiency of their mathematical equipment and their theoretical and practical knowledge of the science of statistics. In the case of the candidates for assistant statistician questions on the literature of statistics were also included.

On the announcement of the results of the examinations the successful candidates received their provisional appointments; Mr. Henry Farquhar being appointed assistant statistician, while Mr. George K. Holmes was placed in charge of the crop-reporting section, and Mr. Harry T. Newcomb in charge of the section of freight rates. Mr. Edwin S. Holmes, another of the appointees, has since been placed in charge of the section of compilation. After satisfactorily serving the probationary period of six months prescribed by the law each of these gentlemen received his permanent appointment. The division has been substantially strengthened by these important additions to its force. It is believed that never in the history of the office have the efficiency and discipline of the clerical force been higher than at the present time.



REPORT OF THE DIRECTOR OF THE OFFICE OF EXPERIMENT STATIONS.

SIR: I have the honor to present herewith the report of the Office of Experiment Stations for the fiscal year ending June 30, 1895.

Very respectfully,

A. C. TRUE,
Director.

Hon. J. STERLING MORTON,
Secretary.

SUPERVISION OF EXPENDITURES OF EXPERIMENT STATIONS.

The act of Congress making appropriations for this Department for the past fiscal year contains the following clause in the paragraph relating to the agricultural experiment stations:

And the Secretary of Agriculture shall prescribe the form of the annual financial statement required by section three of the said act of March second, eighteen hundred and eighty-seven; shall ascertain whether the expenditures under the appropriation hereby made are in accordance with the provisions of the said act, and shall make report thereon to Congress.

As soon as practicable after the passage of this act, the required schedules, together with blanks for tabulating accounts, were prepared and distributed to the experiment stations. In order that the Department might have accurate and complete information regarding the work and expenditures of the stations as the basis for the report of the Secretary to Congress, it was decided that the stations should be visited by representatives of the Department. Inasmuch as a report would under the law be confined to the fiscal year just ended, it was not deemed proper to begin the visitation of the stations until they had had an opportunity to arrange their plans for the expenditures of that year. Moreover, since Congress gave this office no additional funds, the work involved in its new supervisory relations to the stations had to be arranged with reference to avoiding the interruption of other regular duties. Up to the end of the fiscal year thirty-five stations were visited.

In connection with these visits inquiries were made regarding the general management of the stations and their relations to the land-grant colleges. Their methods of keeping accounts were also examined as far as practicable. Conferences were held with the station officers and members of boards of control in which not only financial policy, but also lines and methods of work were discussed. In this way much information regarding the work of the stations which will be of the

highest value to this office was obtained. Personal acquaintance was formed with many station workers and a clear understanding of the local conditions under which the stations are administered was secured. The representatives of the Department were everywhere cordially received and every opportunity was afforded them to obtain such full information as they desired. It was generally agreed that frequent visits from representatives of the Department would enable the stations to gain such advice and assistance as was contemplated when this office was established, would bring the Department into more cordial and sympathetic relations with station workers, and would in many localities strengthen station officers in their efforts to so conduct the stations as to make their work of greatest benefit to agriculture, and prevent the use of public funds in ways not contemplated by the law. A considerable number of the stations have not yet been visited, and many of them have not rendered their financial reports which under the law are not due until February 1, 1896. A complete report on their work and expenditures during the past fiscal year is therefore not possible at this time. This will, however, be prepared as soon as practicable, for transmission to Congress. In a general way, it may be said that the investigation of the work of the stations thus far made clearly indicates that even the poorest of our stations have done considerable work of practical benefit to the farmers of their communities, and that in many cases the services of the stations already rendered have been of very great value to practical agriculture. The greatest hindrances to successful station work have arisen in those communities which have failed to appreciate the fact that the stations are primarily scientific institutions, and that while they should always keep steadily in view the practical results to be attained, they will render the most permanent benefits to agriculture by making thorough investigations based on scientific principles. Badly planned and superficial work may give showy results for a brief season, but in the end is much more likely to bring disappointment and failure.

The necessity of permanency in the work of the stations and in the tenure of office has also not been sufficiently appreciated. Frequent changes in boards of management and station officers have caused rapid changes in the policy and work of a number of the stations, which have either prevented their carrying out any thorough inquiries or discouraged the attempting of important investigations. The proper relations which should exist between the station and the college of which it is a department have not in all cases been understood. As a result, persons employed in both college and station have in a number of instances been given so much work of instruction that they have been unable to efficiently conduct experimental inquiries. In some cases the institutions with which the stations are connected are almost wholly supported from the funds derived from the National Treasury under the acts of March 2, 1887, and August 30, 1890. Inasmuch as these funds are not intended to provide for all the requirements of colleges and stations, such institutions have necessarily departed from a strict observance of the law. In all such cases the office has pointed out the necessity for the State to supplement the funds given by Congress, and has insisted that the Federal laws shall be observed. It is believed that this Department may contribute toward a clearer appreciation of the duties of college and station officers in these and other regards, and may help to bring the local communities to realize more fully the importance of contributing from their own means to build up strong institutions for the benefit of agriculture.

Congress having renewed the provision for the supervision of the expenditures of the stations by this Department in the appropriation act for the current fiscal year, and having given this office additional funds, it is planned to continue the regular visiting of the stations. The work involved in making visitations, tabulating the reports rendered by the stations, and preparing a suitable report of their operations and expenditures involves so much extra labor that some addition to the working force of the office will be required. Funds for this purpose were included in the appropriation for the maintenance of the office during the current fiscal year.

PUBLICATIONS.

During the year the office issued 25 documents, aggregating 2,163 pages. These include 12 numbers of the Experiment Station Record, with a classified table of contents and a detailed index, 5 bulletins, 7 farmers' bulletins, and 1 circular. Articles and tables aggregating 93 pages were also prepared for the Yearbook of the Department.

The sixth volume of the Experiment Station Record comprises 1,121 pages and contains abstracts of 295 bulletins and 42 annual reports of 55 experiment stations in the United States, 78 publications of the Department of Agriculture, and 542 reports of foreign investigations. The total number of pages in these publications is 28,756. The total number of articles abstracted is 1,643, classified as follows: Chemistry, 96; botany, 53; bacteriology, 1; zoology, 5; meteorology, 86; air, water, and soils, 87; fertilizers, 95; field crops, 398; horticulture, 155; forestry, 22; seeds and weeds, 37; diseases of plants, 110; entomology, 99; foods and animal production, 182; veterinary science, 62; dairying, 113; technology, 6; agricultural engineering, 32; statistics, 65. Classified lists of articles, in some cases with brief abstracts, are also given in each number. The aggregate number of titles thus reported is 2,104. The new arrangement of matter in this volume of the Record, by which all abstracts and titles are grouped together under one series of classified topics, and the larger use of brevier type, make it possible to put a considerably greater amount of matter in the same space. This arrangement also makes the Record more convenient to use as a work of reference. Special articles contributed by eminent foreign workers in agricultural science were translated in the office and published in the Record, as follows: "Nitrification in arable soils," by P. P. Deherain; "Heat equivalent of the nutrients of food," by F. Stohmann; "Agricultural investigations in Switzerland," by A. Grete, and "The physical properties of the soil," by Ewald Wollny. Similar contributions by American specialists are as follows: "American digestion experiments," by W. H. Jordan, and "Forage plants of secondary or undetermined importance for the Southern States and the composition of forage plants grown in the South," by S. M. Tracy. There are condensed accounts of the proceeding of the eleventh annual convention of the Association of Official Agricultural Chemists and of the eighth annual convention of the Association of American Agricultural Colleges and Experiment Stations. The volume also contains a number of editorials on topics deemed of special interest to investigators of agricultural science, and under the head of "Notes" facts regarding the current work of the stations, changes in their working corps, additions to their equipment, new legislation affecting their work, etc.

In the preparation of material for the Record during the past year the office has had to a greater extent than ever before the cooperation of

the scientific divisions of the Department. At the request of the Association of Official Agricultural Chemists the accounts of methods of analysis prepared by the abstract committee of that association are now published in the Record instead of being incorporated, as formerly, with the proceedings of the association.

The demand for the Experiment Station Record has steadily increased in spite of the fact that unusual pains were taken during the past year to restrict the circulation. This publication is no longer included in the lists of publications of the Department offered for general distribution. The matter contained in the Record is made up especially to meet the needs of investigators and students in agricultural science, and it is expected to supply the demand for popular information regarding the work of experiment stations and similar institutions by means of other publications. The number of requests for complete sets of the Record has greatly increased of late. As the earlier volumes of the Record are now out of print it will hereafter be impossible to furnish complete sets even to libraries or scientific institutions.

The proceedings of the seventh and eighth annual conventions of the Association of American Agricultural Colleges and Experiment Stations (Bulletins Nos. 20 and 24) contain, in addition to the proceedings of the convention, papers, addresses, and reports on a number of subjects of interest to students and investigators in agricultural science.

Methods and Results of Investigations on the Chemistry and Economy of Food (Bulletin No. 21), by W. O. Atwater, Ph. D., special agent of this Department in charge of food investigations, summarizes the results of inquiries as to the nutritive value and pecuniary economy of food and indicates questions now demanding study, as well as desirable methods of investigation. "Among the results of inquiry dwelt upon are the chemical composition of materials used for the food of man, the proportion of nutritive ingredients, their digestibility, their fuel values, the ratios between their values for nutriment and their cost, the kinds of food and proportion of nutrients best adapted to the demands of people of different classes and occupations, the errors of our food economy, and the sociological and agricultural bearings on the subject." While this bulletin is by no means a complete summary of investigations on human foods and nutrition, it comprises a larger amount of systematically arranged data from American and foreign investigations on the subject than has hitherto been published in the English language.

Agricultural Investigations at Rothamsted, England, during a period of Fifty Years (Bulletin No. 22), by Sir Joseph Henry Gilbert, M.A., LL. D., F. R. S., etc., comprises six lectures delivered by the author in accordance with the provisions of the Lawes Agricultural Trust under the auspices of the Association of American Agricultural Colleges and Experiment Stations in November, 1893. In this publication the distinguished coadjutor of Sir John Bennett Lawes has given "the only condensed, carefully prepared, and authorized review" of the important investigations carried on at Rothamsted during a full half century. Inasmuch as the original reports of the Rothamsted investigations comprise 120 papers, published in various journals and occupying nearly 4,000 octavo and more than 800 quarto pages, the preparation of a complete summary was a work of great magnitude, but of very great usefulness to agricultural science. The value of the bulletin has been greatly enhanced by the addition of much material hitherto unpublished in any form. This is the second biennial course of lectures delivered in this country under the provisions of the Lawes Agricultural Trust. The first course, delivered in Washington, D. C., in August,

1891, by Robert Warington, F. R. S., was published as Bulletin No. 8 of this office, which is now out of print, an edition of 5,000 copies having been distributed. In addition to this course of lectures Sir John Bennett Lawes has distributed to experiment stations in this country 26 complete sets of published papers on Rothamsted investigations, prepared at large cost, and expects to give us as many more. He has also sent to experiment-station workers and boards of control 800 copies of the outline memoranda of these investigations.

Organization Lists of Agricultural Experiment Stations and Institutions with Courses in Agriculture in the United States (Bulletin No. 23) contains a list of experiment stations in the United States, with their governing boards and working staffs; a list of agricultural schools and colleges in the United States, with courses of study and boards of instruction; a list of officers of the Association of American Agricultural Colleges and Experiment Stations and of the Association of Official Agricultural Chemists of the United States, a list of publications received at this office during 1894, Federal legislation affecting agricultural colleges and experiment stations, and regulations and rulings of the Post-Office and Treasury Departments affecting the stations.

Statistics of Agricultural Colleges and Experiment Stations, 1894 (Circular No. 27), contains tabulated statements regarding the faculties and students of agricultural colleges; the property, revenues, and equipment of agricultural colleges and experiment stations; the principal lines of work of the stations; and the number of persons employed in different capacities.

Forage Plants for the South (Farmers' Bulletin No. 18), by S. M. Tracy, is an illustrated account of the practical results of experiments with a large number of forage plants carried on in the Southern States by the experiment stations in cooperation with the Division of Botany of this Department.

Barnyard Manure (Farmers' Bulletin No. 21), by W. H. Beal, of this office, is a popular summary of information regarding the manurial value and use of fertilizers obtained from domestic animals.

The Feeding of Farm Animals (Farmers' Bulletin No. 22), by E. W. Allen, assistant director of this office, is a concise explanation of the principles on which the rational feeding of farm animals is based, together with practical suggestions regarding the selection and preparation of rations and tabulated results of analyses of a large number of feeding stuffs in common use in this country.

Foods: Nutritive Value and Cost (Farmers' Bulletin No. 23), by W. O. Atwater, special agent in charge of food investigations, comprises a careful definition of the technical terms used in reports of food investigations, tables and explanations showing the nutritive value of common food materials and the ways in which they may be combined in diets on the basis of their actual value as food, some general considerations concerning the pecuniary economy of foods, and suggestions regarding wastes to be avoided.

Peanuts: Culture and Uses (Farmers' Bulletin No. 25), by R. B. Handy, of this office, includes a brief description of different varieties of the peanut, the results of analyses, and statements regarding the cultivation of the plant and the uses of the products based on investigations at the experiment stations and the practice of the most successful growers.

Sweet Potatoes: Culture and Uses (Farmers' Bulletin No. 26), by J. F. Duggar, of this office, contains popular statements regarding the culture of this plant, the diseases and insect enemies which ravage it, and the uses of the products.

The Souring of Milk and Other Changes in Milk Products (Farmers' Bulletin No. 29) was prepared in this office on the basis of articles by Prof. H. W. Conn, of Wesleyan University, and includes a popular résumé of the results of scientific and practical investigations regarding fermentations of milk and its products and the means of preventing or controlling them.

PUBLICATIONS IN PREPARATION.

The manuscript of a comprehensive bulletin on the history, cultivation, uses, and enemies of the cotton plant has recently been completed. It was expected that this bulletin would be published during the past year, but its earlier completion was prevented by the prolonged illness of the specialist engaged to prepare one of the most important chapters, which made it necessary to obtain a substitute to do this work.

A bulletin on the objects and work of the agricultural experiment stations in this country has been prepared with special reference to the demand for information regarding the stations in connection with the exhibit of this office at the Atlanta Exposition.

Farmers' bulletins on silos and silage, potato culture, sheep raising, and the feeding of dairy cows are in different stages of preparation, and their publication is expected at an early date. Arrangements are being made for other bulletins in this series. As heretofore, it will be the policy of the office to seek the cooperation of leading specialists in the agricultural colleges and experiment stations in the preparation of farmers' bulletins.

Work has been commenced on a comprehensive bulletin on the corn plant along lines similar to those treated in the bulletin on cotton. The funds at the disposal of the office during the past year were not sufficient to enable it to do more than begin work on this bulletin. It is hoped, however, to continue its preparation actively during the current year.

Reference is made in another part of the report to publications being prepared in connection with the investigations on human foods. (See p. 77.)

CARD INDEXES.

The work on the card index of experiment station literature progressed steadily during the past year. The number of cards distributed has now reached 9,000. The yearly distribution is about 3,000 cards. It is expected that during the coming year this will be increased to at least 5,000 cards. At this rate the index can in a comparatively short time be brought up to date and its usefulness thereby greatly increased.

About 125 sets of the index are distributed gratuitously, and 175 sets are printed for sale, with the permission of Congress, at a price covering the cost of printing. This is fixed at \$1.25 for division blocks and guides, and \$2 per 1,000 for index cards. A number of these extra sets have been subscribed for, the receipts from this source during the past year being \$155.75.

A card index of articles by station workers in other than station publications was undertaken by the office during the past year, and, though still incomplete, has shown its usefulness sufficiently to warrant further efforts to enlarge it. A complete index of this kind would undoubtedly be of great value to station workers. Similar indexes, especially of foreign publications, are being made as a necessary part of the routine work involved in the preparation of publications.

An index of the new varieties of cultivated plants annually introduced by horticulturists has been undertaken on the basis of similar lists formerly prepared by Professor Bailey, of Cornell University. In this work the office has the cooperation of the Division of Pomology.

BIBLIOGRAPHICAL WORK.

During the year ending June 30, 1895, 1,134 books and pamphlets, mostly publications of experiment stations and similar institutions in this and other countries, were added to the library of the office, making a total of 7,201. All publications received were acknowledged, stamped, and catalogued. At the request of a number of experiment station officers a system of exchanges of station publications has been inaugurated. During the past year many duplicates of station publications were received and hundreds of such publications were sent to the stations needing them. If the office were provided with sufficient room to store back numbers of publications of the experiment stations, it could undoubtedly render more useful service to station officers in this direction and materially aid them in completing their files of station publications.

About 2,000 numbers of periodicals were received from the general library of the Department and from other sources, which were recorded, distributed to the different members of the office force requiring them, and returned to their proper depositories. The needs of the work of the office have made it desirable that a list of the works on agricultural subjects issued by different publishers should be made and kept up to date. Our list now includes about 1,000 books and pamphlets which have appeared within the last three years. Title and author cards are made for these works and the title cards are classified on the plan of the card index of agricultural literature published by the office. A number of college and station officers have requested that such a list as this be regularly prepared and published by the office for the use of investigators, teachers, and students. It is thought that with the cooperation of the colleges and stations a quite complete list of this kind might be prepared. Some work was done during the year in preparing bibliographies of various subjects at the request of station officers for their use in connection with special studies they were making.

SEED DISTRIBUTION.

With a view to securing thorough trials of new and rare varieties of plants in different parts of the country, seeds of a number of varieties of forage plants and vegetables were sent to 40 stations and to a limited number of farmers, who agreed to make tests under their direction during the season of 1894. Blanks for reports were furnished from this office at the close of the season. Widespread drought caused the failure of very many of these trials, but some of the stations received a considerable number of reports which will be useful in connection with their own experiments for determining the value of these plants in their respective localities. The present season 22,651 packages of seeds were thus distributed to experiment stations and farmers in 36 States.

The plan heretofore followed of selecting seeds for this distribution from a general list purchased by the Department on account of distribution through Members of Congress has not been altogether satisfactory to the experiment stations. A number of the station officers are, however, of the opinion that the cooperation of the Department and

the stations with a view to obtaining and testing such rare seeds as may seem worthy of thorough trial for a series of years in particular regions might give valuable results. The Department, through its scientific and other correspondence throughout the world, would seem to be in a better position than the stations to learn of new or rare varieties of plants which might be profitably grown in this country. The expenditure of a small sum of money for this purpose might be wisely and economically made if the business were committed to expert agents.

CORRESPONDENCE.

The correspondence of the office continues to grow and to become more complex. The new relations of the Department with the stations growing out of the supervision of their expenditures has already caused additional correspondence requiring much time and thought. The nutrition investigations have also entailed the writing of many letters and the sending out of numerous documents. More letters than ever before have been referred to this office from the general mail of the Department. The publications of the office are so varied in character and the demand for them has been so great that the effort to confine their distribution within proper limits has made it necessary to write many explanatory letters to our correspondents. Liberal use has been made of circulars, and in this way there has been no increase in the clerical force employed to keep the correspondence up to date.

DISTRIBUTION OF PUBLICATIONS.

The methods of distribution of publications are as yet far from satisfactory. The supply of technical publications of the office is oftentimes exhausted too rapidly, and there are not sufficient safeguards to prevent duplication in sending out documents. I am still of the opinion that all orders for the distribution of the technical publications of the office should be indorsed by its Director. On the other hand, the office should not write as many franks for popular publications as it does at present. All uncertainty regarding its functions in the distribution of publications should be removed. Adequate provision should be made for the manifolded of permanent lists.

REPORTS OF THE COLLEGES HAVING COURSES IN AGRICULTURE.

The financial and statistical reports of the colleges receiving appropriations under the act of Congress of August 30, 1890, for the fiscal year ending June 30, 1895, have been deposited in this office, as in previous years.

It is interesting to note that the popularity of special courses, particularly in dairying, is increasing. Short winter or summer courses for adult farmers are also more largely attended. On the other hand, the development of the agricultural colleges and experiment stations and the increase in the number and importance of industries allied to agriculture, which demand workers trained in agricultural science, have made the need for thorough courses in agricultural colleges in this country more imperative. Certainly this country, with its vast agricultural interests, should provide the most ample facilities for the training of teachers and scientific workers in agricultural lines. Our youth ought no longer to be compelled to seek higher education in foreign lands. In obedience to the growing demand for more thorough instruction, our

colleges of agriculture are gradually raising the grade of their courses which lead to graduation and degrees. At the same time they are meeting, as best they can, the demand for more widespread elementary instruction in agriculture.

The necessity for a clearer separation between the elementary and higher courses is, however, becoming yearly more apparent. The attempt of the University of Minnesota to maintain a college and a school of agriculture virtually as separate departments has proved a great success. Several hundred students have attended the school of agriculture during the past year. When the people realize more clearly the desirability of separating elementary and higher courses in agriculture, as in other subjects, they will undoubtedly provide means for the establishment of lower schools in which agriculture shall be taught, and at the same time enlarge the resources of the institutions devoted more exclusively to training the leaders in agricultural science.

One of the most encouraging indications of advancement in agricultural education is seen in the earnest endeavors of teachers of agriculture to improve their methods of teaching. At the recent meeting of the Association of American Agricultural Colleges and Experiment Stations at Denver, a standing committee was appointed to make annual compilations of methods of teaching agriculture in use in different countries with a view to the more definite formulation of methods suitable to the needs of our institutions. The Director of this office was appointed a member of this committee.

ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

The Director of this office was a delegate to the eighth annual convention of this association, held at Washington, D. C., November 13 to 15, 1894. Agricultural institutions in 37 States were represented. The stenographic report of the proceedings was prepared under his direction, and has since been edited by him and the chairman of the executive committee of the association, and issued as Bulletin No. 24. Addresses were delivered by the Secretary of Agriculture, Assistant Secretary of Agriculture, and the Commissioner of Education. Much of the time of the convention was given to earnest discussions of plans for the improvement of the agricultural courses in our colleges and to the best ways of securing cooperation of stations and farmers in experimental inquiries. The following resolutions regarding the supervision of station expenditures by this Department were adopted:

Resolved, That this association heartily approves recent legislation by Congress giving to the Secretary of Agriculture a measure of supervision over the expenditures of the stations.

Resolved further, That this association indorses the scheme of financial statement adopted by the Secretary of Agriculture, and will approve and welcome the closest scrutiny of the work of the stations by the Department of Agriculture, either by personal visitations of an agent of the Department, or such other method as the Secretary of Agriculture may deem most efficient.

INVESTIGATIONS REGARDING THE NUTRITIVE VALUE AND ECONOMY OF FOODS.

The appropriation of \$10,000 "to enable the Secretary of Agriculture to investigate and report upon the nutritive value of the various articles and commodities used for human food, with special suggestions of full, wholesome, and edible rations less wasteful and more economical than those in common use," became available on the passage of the act

making appropriations for this Department, August 8, 1894. By an order of the Secretary, the supervision of the work on nutrition investigations was assigned to this office. Prof. W. O. Atwater, well known as an authority in this line of work, was appointed special agent to take charge of these investigations. Considerable time was expended in perfecting plans, so that investigations did not actually begin until near the close of 1894. A portion of the work was carried on under Professor Atwater's immediate supervision at Wesleyan University, Middletown, Conn. Other inquiries were conducted in a number of representative localities. In accordance with the terms of the law, the cooperation of the agricultural experiment stations was sought as far as was justified by their facilities and the requirements of their other work. Agricultural colleges and other educational institutions as well as benevolent associations were also asked to cooperate with the Department. As a rule only such institutions and associations were invited to join in this work as were in a position to contribute the services of experts and other workers, laboratory facilities, or other resources to supplement the funds provided by the Department. In a number of cases the services or means thus contributed greatly exceeded in value the sums appropriated by the Department. In a few cases, however, the Department carried on this work entirely with its own resources. The cooperative policy enabled the Department to secure the services of trained workers and to collect a very much larger amount of useful data than would have been possible if it had depended solely on the funds at its disposal. Besides the experimental inquiries and other work carried on at Middletown, food investigations were made during the past fiscal year in New York City in connection with the Society for Improving the Condition of the Poor and the Industrial Christian Alliance; in New Jersey, at New Brunswick and other cities, in connection with the New Jersey State Experiment Station; in Pennsylvania, at Pittsburgh; in South Carolina, at Charleston; in Alabama, at Auburn, in connection with the agricultural experiment station of the Agricultural and Mechanical College of Alabama, and at Tuskegee in connection with the Tuskegee Normal Institute; in Missouri, at Columbia, in connection with the University of Missouri; in Tennessee, at Knoxville, in connection with the University of Tennessee; in Indiana, at La Fayette, in connection with Purdue University; in Illinois, at Chicago, in connection with the Hull House; in Maine, at Orono, in connection with the Maine State College; in Connecticut, at Suffield.

The work carried on was in accordance with the plan presented in my last report, and included the following:

- (1) Studies of the composition, nutritive value, and cost of food materials in different localities in the Eastern, Southern, and Central States. The special object of these inquiries was to find out what food materials people actually buy, how much they pay for them, what nutriment they contain, and what is the relation between actual nutriment and cost.

- (2) Studies of actual dietaries, with a view to learning what are the kinds and amounts of food materials actually consumed by people in different places, of different occupations, and under different conditions. At the Maine State College, after the ordinary dietary at the students' boarding house had been studied, observations were made with a view to determining the effects on the health and comfort of the students of supplying nutrients of a more expensive kind, largely from meats, and also of cheaper dietaries composed largely of milk and vegetable foods.

(3) Studies on the digestibility of foods.

(4) Improvement of methods of investigation. These were conducted at Middletown, and consisted chiefly of investigations to develop improved forms of bomb and respiration calorimeters.

(5) Special inquiries on metabolism and the carbohydrates of flour and bread were undertaken to a very limited extent. Researches in these and other lines, especially those relating to the ways in which food is used in the body, can not be undertaken to any great extent with the means at present at the disposal of the Department. It is hoped, however, during the present year to devote greater attention to the more strictly scientific work so much needed as a basis for the working out of practical results.

(6) Compilation of results of inquiries on food conducted in this country and abroad. This has included the tabulation and compilation of a large number of food analyses made in different places, which had not hitherto been reduced to a strictly comparable basis, and the examination, abstracting, and tabulation of more than a thousand experiments on metabolism from accounts scattered through a large number of foreign publications, chiefly periodicals. Thus far food investigations have been for the most part carried on by independent workers, who have published the results in manifold forms. This line of investigations has been systematically pursued during so brief a period that almost no attempt has been made to bring together the results into convenient tables and manuals for the use of students and investigators. Until a considerable amount of such work is done it is well-nigh impossible to carry on anything more than superficial investigations. This is especially true in this country, where collections of the literature of this subject are rare. It is believed that the Department can do no more useful service in this line of investigation than to provide for compiling the results of European work so as to make them readily available to our investigators. Relatively small funds will be needed for this purpose, and this work can be easily carried on without interfering with the progress of original food investigations in this country. In fact, the reducing of the methods and results of foreign investigations to such form that they can be readily used in this country will greatly stimulate studies along this line in our institutions and will enable our investigators to proceed without delay to advance knowledge in this line.

(7) Preparation of publications. Besides the compilations above referred to, reports of inquiries made during the year have been prepared and are rapidly being reduced to form for publication. Until the appropriation for food investigations became available the funds devoted to this kind of inquiry which were available for the preparation of reports had been so small that a large mass of material had accumulated which required to be worked over and joined with the work done during the past year before publication could be properly made. For example, a standard table of the results of food analyses is essential for use in calculation of the results of dietary studies. The table hitherto in use for that purpose was very incomplete and unsatisfactory. Analyses of many food materials were entirely lacking. The averages for others were based on insufficient data. During the year the number of food analyses tabulated has increased from about 1,100 to over 3,000. The work of compiling the table of averages and minimum and maximum on the basis of this large number of analyses is almost completed. The new standard table of analyses thus prepared will mark an important advance in one of the fundamental elements of food investigation. As

stated above (p. 70), a résumé of food investigations in this country and abroad has been published as Bulletin No. 21 of this office. An article of a more elementary character on the nutritive value and cost of foods was published as Farmers' Bulletin No. 23. Another popular article explaining the character of food investigations and giving some of the practical results, together with tables of analyses and suggestions for dietaries having different combinations of food materials in amounts proper for complete nutrition and the cost of these dietaries, was prepared for publication in the Yearbook of the Department.

The amount of material suitable for publication now in hand will make it practicable to issue frequent technical and popular publications during the coming year.

The following brief summary may serve to indicate more definitely the character and amount of work performed in connection with nutrition investigations during the past year:

INVESTIGATIONS.

Connecticut.—At Middletown, in cooperation with Wesleyan University and Storrs Experiment Station: 11 dietary studies, including one involving digestion and metabolism experiment; 150 analyses; 6 digestion experiments with man; 600 calorimeter combustions of food materials; investigations to improve bomb and respiration calorimeters. At Suffield: 2 dietary studies in a farmer's family, with analyses.

Maine.—At Orono, in cooperation with Maine State College: 3 dietary studies in a students' boarding house, including experiments with expensive and cheap rations; 189 analyses.

New York City.—In cooperation with the Society for Improving the Condition of the Poor and the Industrial Christian Alliance: Studies of food supply and of 12 dietaries of people in congested districts, 6 with analyses, and all with weights and cost of food. Sociological data were also gathered.

New Jersey.—In cooperation with the New Jersey State Experiment Station: Studies of the weight per loaf, price, and composition of bread sold in the large cities of New Jersey; 2 bakery experiments, with analyses of materials used and bread produced; 1 dietary study, with analyses.

Pennsylvania.—At Philadelphia: Analyses of sandwiches furnished school children of the college settlement. At Pittsburg: One bakery experiment, with analyses of materials used and bread produced; studies of the bread supply of Pittsburg; 1 dietary study, with analyses.

South Carolina.—At Charleston: Investigations of the food supply and consumption of people of different occupations.

Alabama.—In cooperation with the Alabama Experiment Station and Tuskegee Normal Institute: 8 dietary studies of typical negro families, with analyses; studies of food supply, with analyses.

Missouri.—In cooperation with the University of Missouri: 2 dietary studies in a club of 100 students, with analyses; studies of food supply of 300 families.

Tennessee.—In cooperation with the University of Tennessee: 3 dietary studies in a students' club and 1 in a private family, with 54 analyses.

Indiana.—In cooperation with Purdue University: 2 family dietary studies, with 44 analyses; special investigations on the carbohydrates of flour and bread.

Illinois.—Chicago, in cooperation with Hull House: Studies of food supply and 41 dietaries of working people.

ADMINISTRATIVE AND EDITORIAL WORK.

Visiting different localities to make preliminary arrangements for investigations. Immediate supervision of the investigations in New York City.

Correspondence and other office routine.

Preparation of Farmers' Bulletin No. 23; article on food and diet for Yearbook of the Department, with accompanying tables; and schedule for dietary studies.

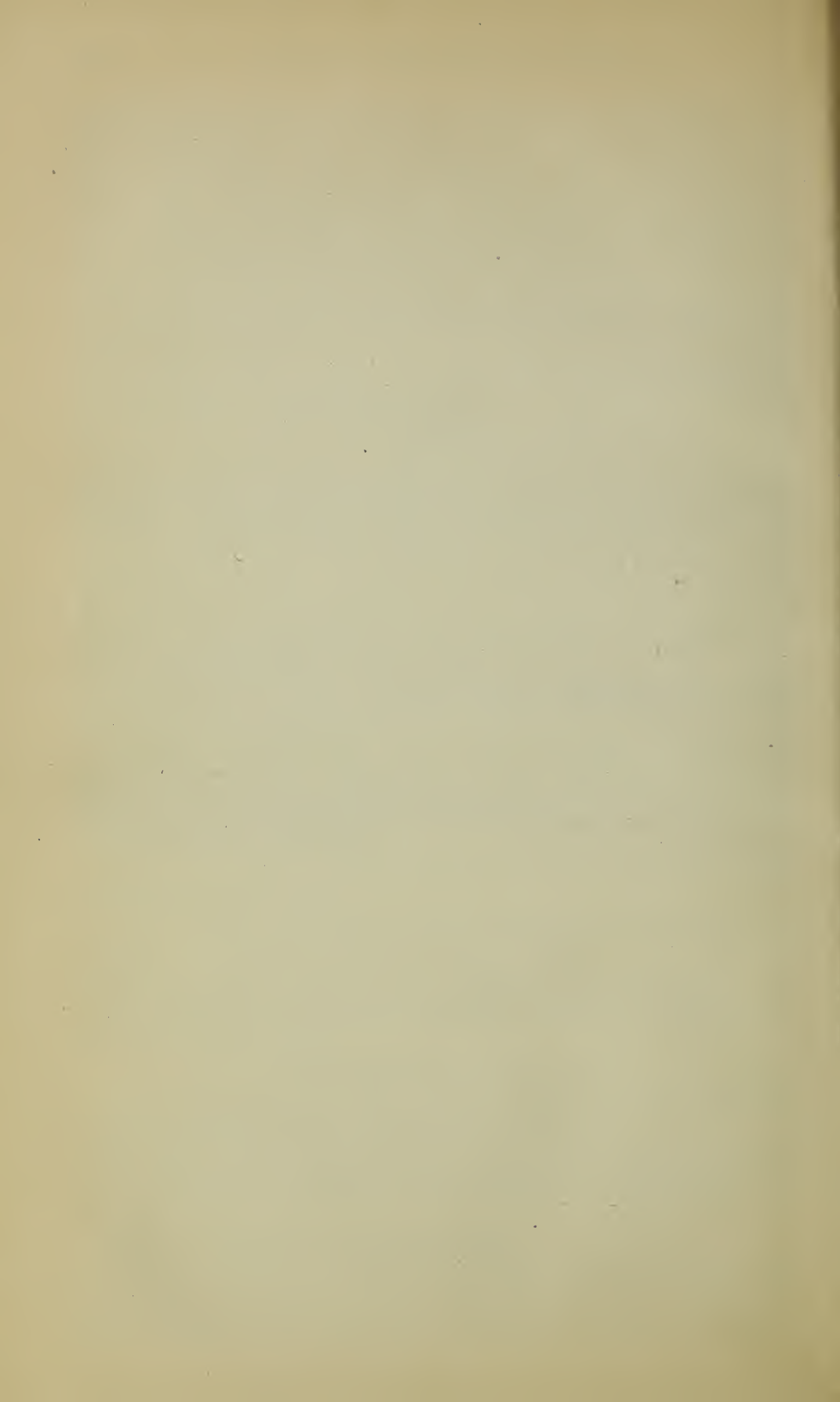
Proof reading of these publications and of Bulletin No. 21 on the Chemistry and Economy of Food.

Verifying and editing reports of investigations outside of Middletown.

Tabulation and compilation of analyses of foods.

Compilation of European investigations, as follows: Investigations on metabolism of men and domestic animals. (Over 1,000 experiments published in a great variety of journals have been summarized in tables, with accompanying text.) Summary of digestion experiments for Bulletin No. 21. Translation of article on "Heat equivalent of the nutrients of food," by Stohmann, for the Experiment Station Record.

The appropriation for nutrition investigations having been continued and increased, arrangements have been made to carry on inquiries during the present year along the lines and on the policy outlined above. The institutions and associations which have hitherto cooperated with the Department have given assurances that they will continue to pursue the same liberal policy in their arrangements for this year's work. Other institutions, whose ample resources give promise of successful work in this line, have signified their desire to join with the Department in this enterprise on equally satisfactory terms. The effort will be made to build up centers of inquiry where the more scientific and fundamental problems can best be investigated, where workers in this line can be efficiently trained, where the importance and usefulness of accurate information regarding the rational nutrition of man will be impressed upon large bodies of students, and from which the practical results of food investigations may be widely and efficiently disseminated. The accounts of food investigations thus far published in this country have awakened great interest in this subject, especially among physicians, teachers, clergymen, army and navy officers, managers of benevolent institutions, and persons actively engaged in seeking practical solutions for the great problems arising from the complex sociological conditions of modern times. It is believed that the investigations now in progress under the direction of this Department will bring results which will very clearly show the usefulness of this kind of research. It must, however, be remembered that inquiries on human nutrition have as yet covered only a small portion of the field which must be traversed before a complete science of the nutrition of man can be said to be established on a sure basis. The investigations thus far made have plainly shown the inadequacy and wastefulness of the dietaries of large numbers of people. They have also demonstrated that dietaries made to conform to the facts and principles ascertained through scientific researches may be economically and usefully adopted on a large scale. This is notably shown in the experience of the great German armies, whose rations are made up in accordance with the standards formulated by the men of science who have given the most attention to investigations on human nutrition.



REPORT OF THE CHIEF OF THE DIVISION OF CHEMISTRY.

SIR: In conformity with your order of July 22, 1895, I beg to hand you herewith the executive report of the Division of Chemistry for the fiscal year ended June 30, 1895.

Respectfully,

H. W. WILEY,
Chief.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE YEAR.

NUMBER AND KINDS OF SAMPLES RECEIVED FOR ANALYSIS.

A statement of the number and kinds of samples received for analysis, together with a classification thereof, is given in the following tables:

Classified list of samples for analysis received during the fiscal year ended June 30, 1895.

	No. of samples.		No. of samples.
Ambergris.....	4	Ocher.....	1
Ash.....	7	Oil from <i>Phallus impudicus</i>	1
A. O. A. C. samples.....	19	Oleaginous nuts.....	1
Beeswax.....	1	Peanuts and peanut products.....	48
Cane juice.....	2	Phosphate rock.....	93
Cereals.....	394	Pottery glaze.....	1
Chemicals.....	10	Residue from water.....	2
Clays and kaolins.....	10	Resins.....	300
Dairy products.....	6	Sediment from maple sirup.....	1
Fermented liquors.....	12	Soils.....	63
Fertilizers.....	18	Sorghums.....	246
Foods and feeding stuffs.....	37	Substance deposited on snow.....	1
Gold ore.....	2	Sugar beets.....	35
Gum of <i>Eucalyptus calophylla</i>	1	Tanning materials.....	7
Insecticides.....	6	Thistle killer.....	1
Kitchen grease.....	1	Typewriter ribbons.....	10
Lard.....	5	Urine.....	2
Limestone.....	1	Water.....	17
Linseed oil.....	1	White lead.....	1
"Lithontriptic".....	1	Wool ola.....	1
Marls.....	5	<i>Yucca angustifolia</i>	1
Mescal, <i>Anhalonium lewintii</i>	1		
Miscellaneous minerals.....	38	Total.....	1,420
Miscellaneous samples.....	5		

Statement showing the number of samples and requests for analysis received from the different divisions and offices of this and other Departments during the fiscal year ended June 30, 1895.

Department of Agriculture:	No. of samples.		No. of samples.
Office of Secretary.....	1	Bureau of Ethnology.....	1
Office of Assistant Secretary....	68	Commissioners of the District of Columbia	1
Office of chief clerk.....	8	Post-Office Department, office of chief clerk.....	2
Division of Agricultural Soils....	1	State Department, office of Secretary.....	4
Division of Agrostology.....	1	Treasury Department:	
Division of Botany.....	4	Office of Secretary.....	1
Division of Entomology.....	8	Office of Register.....	52
Division of Forestry.....	300	Grand total	725
Division of Microscopy.....	2		
Office of Experiment Stations....	6		
Division of Ornithology.....	1		
Office of property clerk.....	6		
Division of Road Inquiry.....	5		
Division of Vegetable Pathology.	253		
Total	664		

The total number of samples received for analysis during the fiscal year was 1,420. The total number of analyses completed during the fiscal year was 613. The number of samples on hand and under examination at the end of the fiscal year was 807. Of the unfinished samples, nearly the whole number is composed of cereals received from the Division of Vegetable Pathology and resins received from the Division of Forestry.

WORK DONE FOR OTHER DIVISIONS AND OTHER DEPARTMENTS OF THE GOVERNMENT.

The Division of Chemistry is always ready to cooperate most cordially with other divisions of the Department or with other Departments of the Government in the chemical work which they wish to have done for official purposes. The list of samples received, officially, from other divisions of the Department and other Departments of the Government illustrates in a marked way the extent of the cooperation above noted. When such cooperative work can be accomplished in one or two months and with the aid of one or two assistants, it does not interfere in any notable degree with the regular investigations of the division. When, however, the work extends over a period longer than that above mentioned, extending even into years, as is the case with the assistance which has been rendered to the Division of Forestry, it seems eminently proper that the salary of the assistant or assistants employed should be paid from the funds of the division benefited.

With such an arrangement for all work of any great magnitude, the Division of Chemistry is ready and willing to do all the chemical work required or desired by other divisions of the Department not having chemical laboratories of their own.

INVESTIGATION OF FOOD ADULTERATION.

During the fiscal year the investigations of food adulteration consisted in the prosecution and practical completion of the work relating to cereal products and the manufactured articles therefrom. As was to be expected, no adulterations of cereal products with gypsum, terra alba, and the like have been found in this country. European investigators often find instances of such adulteration, but happily the per-

nicious practice of mixing inert and indigestible substances with flour and meal has not found a foothold in this country in so far as our investigations have gone.

An extensive investigation was made for the detection of alum in bread and biscuit and a careful search conducted for the detection of deleterious coloring matters in cakes. The results of all these investigations will soon be offered for publication as Part 9 of Bulletin No. 13.

In connection with this work the analyses of the cereals exhibited at the World's Fair were completed and the results of these analyses have, since the ending of the year, been published as Bulletin No. 46.

During the year the compilation of the investigations of the possibilities of starch production from the cassava plant was completed and published as Bulletin No. 45.

The foregoing résumé comprises the work accomplished in the investigation of food and food adulterations during the year.

WORK FOR THE ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.

During the year the division made a complete study of all the problems proposed by the reporters of the Association of Official Agricultural Chemists. The results of the work of this association have been of far-reaching benefit to practical agriculture. In the twelve years of its existence it has succeeded in reducing to a system the heterogeneous and often erroneous methods which at the time of its organization were in use in the analysis of soils, fertilizers, and agricultural products. The work of the association at this time extends over the whole range of chemical-agricultural activity, and while no separate account is made of the time employed in doing the work of the association, it may be safely said that it was equivalent to the work of at least one assistant for the whole year. In addition to the chemical work already mentioned, the proceedings of the eleventh annual convention of the association, comprising 403 pages, were edited by the Division of Chemistry and published by the Department.

INVESTIGATION OF SOILS.

During the year the methods employed in the chemical and bacteriological examinations of soils were more thoroughly systematized and the scope of the work greatly increased. A vegetation house capable of holding more than 200 pots for cultural purposes has been constructed and fully equipped. The cooperation of the experiment stations has been invoked in the way of securing samples of typical soils for chemical analysis, pot cultures, and bacteriological examination. It was not until the end of the fiscal year that this work was fully inaugurated, and therefore no special report can be made thereon until after the first series of cultures shall have been completed.

MISCELLANEOUS WORK.

The character of the miscellaneous work of the division is sufficiently set forth by the table of samples furnished for analysis. Happily there has been a continual decrease in the demand for the analysis of samples of ores, minerals, and mineral and potable waters. Only in such cases as are specially requested by the Secretary or Assistant Secretary are such analyses made. In other cases it is the uniform practice to refer inquirers for such work to the agricultural experiment stations of the

respective States from which the samples may be sent. In the same way the requests for analyses of fertilizers and fertilizing materials are referred to the respective experiment stations, unless some special reason should be presented for their examination in this laboratory.

OFFICIAL ADVERTISING.

A considerable degree of annoyance has been experienced in the past by perverted references to the analyses of the division used for advertising purposes. In the present state of our laws there is no legal objection to advertisers referring to the published reports of the Department in support of the virtues of the wares they offer for sale, but in no case is there any warrant for the exaggeration, suppression, perversion, or misstatement of the facts. In the hundreds of advertisements which have been noticed, and in which the work of this division has been referred to, there has not been a single case in which the facts were set forth as published. There is therefore a just reason for complaint. In most instances, when a remonstrance has been made, a proper correction and apology have been forthcoming. In some cases, however, a polite protest has been answered with threats and vituperation. It seems to me that there should be some method adopted by means of which these advertising misrepresentations could be prevented.

CHANGES IN PERSONNEL.

The working and executive force of the division during the year suffered a serious loss in the resignation of Dr. G. L. Spencer, first assistant chemist. Dr. W. G. Brown, formerly professor of chemistry in Washington and Lee University, Lexington, Va., was appointed to the vacant position on November 27, 1894.

INVESTIGATIONS FOR FISCAL YEAR ENDING JUNE 30, 1896.

During the present fiscal year the work of the division will be pushed along the lines indicated in the foregoing report. In the matter of food adulteration it is hoped that the investigation of canned and preserved goods may be completed, with special reference to the composition of infants' and invalids' foods. The usual miscellaneous work of the division will be prosecuted. Investigations into the composition of resins for the Forestry Division will be continued. The analyses of the samples of cereals furnished by the Division of Vegetable Pathology will be completed. The original work in the investigation of the chemical and bacteriological examinations of soils will be continued in the direction already noted, and a check upon the chemical analysis will be made by the actual results of pot cultural experiments. The division will continue to cooperate with the Association of Official Agricultural Chemists in the investigations of methods of analysis of soils, fertilizers, and agricultural products.

REPORT OF THE CHIEF OF THE DIVISION OF FORESTRY.

SIR: I have the honor to submit herewith a report on the work of the Division of Forestry for the fiscal year ending June 30, 1895, together with recommendations and estimates for the fiscal year 1897.

Respectfully,

B. E. FERNOW,
Chief.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE YEAR.

PUBLICATIONS.

Besides the four chapters for the newly established Yearbook of the Department under the caption of "Forestry for Farmers," only one bulletin, No. 9, Report on the Use of Metal Railroad Ties, Preservative Processes and Metal Tie Plates for Wooden Ties, prepared by E. E. Russell Tratman, has been published during the year; but at the present writing three further bulletins of the list enumerated in last year's report have been submitted for publication, and others will follow as rapidly as the manuscript can be prepared.

TIMBER INVESTIGATIONS.

The continuance of these investigations, the most comprehensive of the kind ever undertaken, has demanded most of the attention and the largest share of the appropriations for the division; but the great value of such investigations and the promise of immediate practical results seem to justify such expenditure.

The collection of material, mainly of Southern timbers, was carried on as hitherto by Dr. Charles Mohr, agent of the division, and the testing was done under contracts as hitherto by Prof. J. B. Johnson at the Washington University laboratory in St. Louis. Additional collections of white pine were made in Michigan and Wisconsin by Mr. Austin Cary. Altogether 175 trees, representing 24 species from 5 different sites, were collected, furnishing 13 carloads of logs to the mechanical laboratory and over 1,000 corresponding disks to the physical laboratory at Washington. The total collection to date for this work comprises 761 trees, representing 39 species.

At St. Louis 13,000 tests were made, 340 of which were on large columns and beams, and a large amount of material was placed in dry kilns for next year's work. The test work has been carried on under contract at a given price for each of the specified tests, the price including the

primal computations and final discussion of results, and so far over 34,000 tests have been recorded.

Besides the general series of tests, the object of which is to furnish reliable data of the average values of strength for the various species, several special series were made to determine the variation of strength in various parts of the tree, the variation of strength with different moisture contents, the effect of dry-kiln treatment, the difference between tests on small and large pieces, etc. Although an enormous array of data on a number of species has accumulated, the final collecting and preparation of the same for publication must be delayed until enough material of each species has been tested. The results on the four Southern pines have been compiled and are ready for publication.

At Washington, the disk material corresponding to the test logs was examined as usual. Of the material on hand the wood of 306 trees, represented by 9,000 specimens, was dried, weighed, and measured, and the results in part computed.

Results referring to the four Southern pines, representing 163 trees and over 24,000 separate values, have been computed and arranged for publication, establishing the relative values for these pines, which show that shortleaf and loblolly pine are inferior to longleaf and Cuban pine by about 20 per cent; that the wood near the stump is by 25 to 30 per cent heavier, hence better, than that of the upper logs; that the wood produced by trees 25 to 60 years of age is the best and that in old trees a variation of 15 to 25 per cent in weight, and hence quality, occurs, the greatest difference being in the butt log, thus giving valuable hints regarding the true quality of the much despised sapling timber and data for correct selection of material. Special experiments in shrinking and swelling were continued and it was found that the wood of all pines varies in this in proportion to its weight; that treatment with high temperature under pressure does not, as has been claimed by the owners of certain processes of wood treatment, do away with shrinkage either in pine or oak.

TURPENTINE ORCHARDING.

A series of experiments was begun with the object of determining how far the great deterioration of resin, which causes so much loss to the turpentine orchardist, is due to unavoidable physiological causes and how far to existing practice and how the practice may be improved. This series has so far been only tentative and, it is hoped, may be more systematically carried on during the next season.

TREE MEASUREMENTS.

A series of measurements of the rate of growth of white pine was made by Mr. Austin Cary on various sites in Michigan and Wisconsin. These comprise detail measurements of over 400 trees, besides the determination of 13 acre-yields. With this knowledge added to the measurements of young pine groves in Massachusetts made the previous year, a fair statement of the growth of white pine has been evaluated and will presently be ready for publication.

Altogether, including the measurements carried on in connection with the collection of material for timber investigations, there are now on hand measurements of 1,700 trees, mostly Southern and Northern pines, spruce, and a few hard woods, in addition to 57 acre-yields. Over 500 of these measurements have been worked up and tabulated, and the curves representing the growth development prepared for exhibit at Atlanta and for use in publications. The results show, among other

valuable facts, that the longleaf and Cuban pines grow both in height and thickness much faster than had been supposed, the period of slow growth beginning much later in these than in the faster growing loblolly and shortleaf pines. The white pine, represented by over 500 analyses, excels both in rapidity and continuity of growth, trees over 200 years old having been found to have made $1\frac{1}{2}$ cubic feet and over annually for a century and a half. This work, upon which as a final basis the question of profitable forestry and many other forestal questions can be discussed, should be continued until the rate of growth and capacity for production of all our important species is established.

FOREST-PLANTING EXPERIMENTS.

A series of experimental plantings was planned to be made in the Western treeless country for the purpose of testing the best varieties of trees suitable for forest planting and the methods best adapted for planting in the unfavorable conditions prevailing.

Agreements have been entered into with the agricultural experiment stations in South Dakota, Nebraska, Kansas, and Colorado, according to which the station authorities agree to furnish land and superintendence free of charge, the Department furnishing plans, plants, and labor in the establishment of such plantations.

Preliminary to such arrangement Mr. Keffer, the assistant chief of the division, made a tour of inspection, as a result of which a report on Western Forest Planting was prepared, to be published in the Yearbook for 1895.

PROPAGANDA WORK.

Besides the information given out by publications and in the correspondence of the division, frequent calls for lectures and addresses are responded to, for the purpose of furthering the establishment of a forest policy among the people.

A series of lectures was given by the writer before the Summer School at Colorado Springs, Colo.; and single lectures in Madison, Wis., at the invitation of the legislature; St. Paul, Minn., before the Commercial Club; at Brooklyn, N. Y., before the American Association for the Advancement of Science; before the Brooklyn Institute; at Newton, Mass., and in other places.

In connection with the members of the American Forestry Association frequent hearings before Congressional committees and consultations with reference to desirable legislation on behalf of public forest reservations and timber lands have been attended to.

EXPENDITURES AND RECOMMENDATIONS.

The expenditures for the year 1894-95 may be classified as follows:

Office salaries.....	\$8,320.00
Salaries of agents.....	4,708.92
Timber tests.....	10,264.20
Timber investigation materials and freight.....	1,569.60
Copying, computing, and collating timber-test data.....	1,713.56
Rate of growth measurements.....	400.00
Traveling expenses.....	831.50
Miscellaneous.....	439.65
Balance unexpended.....	72.57
Total.....	28,320.00

The appropriations for the present year have been increased by \$200 in the salary of the assistant chief and \$5,000 in the lump fund toward beginning the forest-planting experiments in the Western States.

It is desirable that during the coming year a part of the timber-test work be transferred to Washington in order to secure a more direct supervision, to reduce the difficulty of arranging special series of tests by correspondence, and to bring the tests into closer relation with the work of physical examination of the test material. The arrangement hitherto existing was necessitated by the absence of the needed facilities at the Department. At present a wooden building somewhat better than that hitherto occupied has been assigned, which, however, still lacks all facilities for the work. Satisfactory and economical continuance of this work requires the fitting up of a workshop with water and heating appliances, a 50,000-pound test machine, power saw and planer, with either electric or steam power; a "damp room" for temporary storage of fresh material, removal of the existing dry kiln to a convenient part of the new structure, and the partitioning off of an office for use in microscopic work, computing, etc. Additional expert assistance is naturally also needed if the test work is to be done at the Department.

The estimates for the year 1895-96, according to your wishes, have not been increased. Nevertheless, the statistical work which I have recommended in my report for the last year should and could be entered upon, besides continuing the lines followed hitherto. The absence of knowledge of the extent and value of our forest resources became again painfully apparent, when an attempt was made in connection with the exhibit at the Atlanta Exposition to give information regarding the Southern forest resources.

Although no increases in appropriations or salaries are proposed, and fully recognizing that a change in salaries can be effected only through a general scheme of reorganization, I deem it, nevertheless, only justice to myself and to my collaborators to again call your attention to the inadequacy of salaries paid to officers and scientific staff, and the fact that for positions of similar character higher salaries are paid in private institutions, in other Departments, and in one branch of the Department of Agriculture, the Weather Bureau. Without reiterating arguments for an adjustment of this condition and for the employment of the best paid men in Government service, I desire to emphasize that such adjustment would be in the line of true economy.

REPORT OF THE ENTOMOLOGIST.

SIR: In accordance with an official order received July 22, 1895, I have the honor to submit my executive report for the fiscal year ending June 30, 1895.

This report covers the work of the Division of Entomology during the past fiscal year, an outline of the plan of work for the current fiscal year, and estimates for appropriations for the next fiscal year.

Respectfully,

L. O. HOWARD,
Entomologist.

Hon. J. STERLING MORTON,
Secretary.

REVIEW OF THE WORK AND THE AMOUNT AND CHARACTER OF THE EXPENDITURES INCURRED DURING THE FISCAL YEAR ENDING JUNE 30, 1895.

The amount appropriated by Congress for the Division of Entomology, aside from statutory salaries, was \$20,300. Of this amount there was expended the sum of \$16,822.87, leaving an unexpended balance, which was covered into the Treasury, of \$3,447.13.

The main items of expense may be grouped as follows:

Salaries of investigators and other employees, stationed for the most part in Washington, D. C.....	\$13, 239. 27
Salaries of field agents.....	901. 75
Miscellaneous office supplies and expenses.....	1, 211. 94
Traveling expenses.....	1, 469. 91
Total.....	16, 822. 87

The character of the work of the division has been much the same as in previous years. It may be considered under the following heads:

- (a) Investigations upon special insects or groups of insects.
- (b) Experiments with insecticides and insecticide machinery.
- (c) Correspondence.
- (d) Determination of insects sent in by entomologists of agricultural experiment stations and others.
- (e) Proof reading and other supervision of the publications of the division.
- (f) Bibliographic work.
- (g) Purely classificatory and monographic work upon groups of insects which have a bearing upon agriculture.

(a) The special investigations of note carried on during the year were substantially as follows:

The subject of insects injurious to stored grain, mentioned in a previous report, has received continued investigation. The lines upon which the investigation was begun have been broadened, and careful studies are being made of the complete life history of every insect which can be found to have the habit of feeding upon products of this class. Work of this kind demands a great deal of time, and a complete report must be still further delayed. An advance paper, treating of a few of these insects only, has been published in the Yearbook of the Department for 1894.

Probably the most striking insect outbreak of the fiscal year was the appearance of an insect (*Anthonomus grandis*) in the cotton fields of south Texas, which damaged the squares and bolls, ruining the seed and the fiber. Damage to the amount of many thousands of dollars was done in the latter part of 1894 and an investigation was immediately begun by the division. The insect was found to be a species which had been brought across from Mexico, and it has, therefore, been termed the Mexican cotton boll weevil. An agent was sent into Mexico to investigate the history of the insect in that country, and upon his return he was sent through the infested region in Texas and finally located at Brownsville in order to make consecutive studies throughout the year upon the life history of the species. Through this agent and an assistant of the division, who was sent to Texas for the purpose, a most careful investigation of the whole subject has been carried on and a complete bulletin giving results will probably be published during the coming winter. While it may be premature to hint at results at the present time, it is safe to say that the early fears as to the possible spread of the species throughout the entire cotton belt of the United States have been found to be unjustified in part, at least, and a tolerably efficient remedy for south Texas has already been ascertained. The expenses of this investigation have naturally been drawn from the special fund for the investigation of the bollworm of cotton. Further observations have also been made upon the true bollworm, and, incidentally, upon a number of other insects affecting the cotton plant. A complete though condensed summary of the subject of insects injuring cotton has been prepared for publication in the Handbook of Cotton Culture to be issued by the Office of Experiment Stations.

Great efforts were made during the year to ascertain exact points throughout the fruit-growing regions of the eastern United States at which the San Jose or pernicious scale had established itself. Extensive experiments, with remedies, were carried on through the year in a large infested orchard some 50 miles from Washington. The results of the investigation have been published in part in Nos. 4 and 5, Volume VII, Insect Life, and an efficient and practical remedy for the Eastern States has been found. Long experimentation with remedial measures against this insect, it may be here stated, was found necessary owing to the fact that remedies in use in California, and which are efficacious in that climate, were soon found to be absolutely useless in the Eastern States. A monographic treatment of the subject of the San Jose scale is in preparation, to be issued in bulletin form. Apropos to this investigation of the San Jose scale, new studies were made of all of the principal scale insects of the orchard and remedies against many of them were tried upon new lines. The results have been published in the Yearbook of the Department for 1894.

Some ten years ago the subject of the insects affecting the orange was investigated by this office through a special agent, Mr. Henry G. Hubbard. The edition of this report which was published in 1885 soon became exhausted, and deeming that the time has arrived for the reinvestigation of this subject, Mr. Hubbard was reappointed and has begun the preparation of a new report upon a somewhat different plan, and which will include a consideration of all the insects which affect citrus plants. Not only will the species now found in the United States receive treatment, but, also, species now occurring in other parts of the world and which are liable to be introduced into the United States in the near future. The report is fast approaching completion, though its publication may be delayed for a considerable time, owing to the necessity for many illustrations.

An investigation, which may prove ultimately to be of great importance, has been entered upon. This is the geographical distribution of injurious insects appearing in devastating numbers. The records of the division are being thoroughly searched for definite localities and the assistance of experiment station entomologists has been invoked with good results. The localities ascertained are being platted upon a series of maps, which will eventually show at a glance the places visited by unusual numbers of the various species of injurious insects. With such data at hand, studied in connection with the range of the so-called "life zones" upon this continent, it is safe to say that entomologists will be able to predict, at least with certain species, the geographical lines at which their progress will stop, and that they will be able to advise agriculturists with some degree of certainty as to the possibility of the appearance of well-known insect pests in any given locality.

The subject of insects injurious to shade trees attracted attention in the early part of 1894, and investigations of several of the most prominent species were begun.

Several minor investigations of insects of transient importance have been made. Some of these have been as follows:

A local outbreak of a serious character in Virginia of the American locust; several local outbreaks of the red-legged and differential locusts in other parts of the country; the life history of the cotton or melon plant-louse, an insect which was especially abundant in the spring of 1894; the currant stem girdler; several dipterous insects which mine the leaves of garden vegetables; reported damage by insects to the watermelon crop in Georgia and Texas. The work of the division in bee culture was practically finished with the completion of the Manual of Instructions in Apiculture, which has been mentioned in previous reports.

(b) Some of the experimental work which has been carried on during the year has been referred to in the preceding paragraphs in connection with special investigations. Against scale insects of different kinds experiments have been made, and many of them repeatedly, with forty-six different washes. The comparative results have been tabulated and published during the year. Experiments have been made with different arsenical poisons, both as regards their effect upon insects and as to their effect upon the foliage and action upon the health of the plant. This same line of experimentation has also been carried on with certain new insecticides, the object being chiefly the securing of some cheaper substance to take the place of expensive but otherwise satisfactory insecticides already available. Experiments upon the Department grounds were also made in the line of treatment against insects with hydrocyanic-acid gas. New devices for spraying have

come up from time to time and have related chiefly to the mechanical mixture of insecticide substances with water in process of spraying. These have been carefully tested to determine their value for practical purposes.

(c) The correspondence of the division has been much heavier than in any previous year. Circulars and mimeograph forms have been used as far as possible to reduce the bulk of the correspondence. Eight additional circulars upon insects of first-class importance have been printed for the special purpose of reducing the bulk of the correspondence. Notwithstanding these facts, nearly one-third more letters have been written during this fiscal year than during the previous one, the number reaching about 6,000.

(d) A very large share of the time of several assistants in the division is taken up in the determination of insects for workers in systematic and economic entomology. This is a legitimate work for the division and a very valuable one, inasmuch as it helps to render available the labors of many of the experiment station entomologists. Work in this direction has been about as heavy as during the previous fiscal year.

(e) The publications of the division have been as follows: Insect Life, Volume VI, No. 5, and Volume VII, Nos. 1, 2, 3, and 4. Old series of general bulletins, Nos. 32 and 33. Farmers' Bulletin No. 19, revised edition. Circulars 5, 6, 7, 8, 9, 10, 11, and 12, with an edition in Spanish of No. 6. Bibliography of American Economic Entomology, Part IV, with index. Total number of printed pages amounts to 749.

(f) In bibliographic work the division has heretofore done but little, aside from the publication of the Bibliography of the Writings of Walsh and Riley. Mr. Henshaw's bibliography of the writings of other American economic entomologists is about completed, and the first half, as above stated, has been published during the past fiscal year. The other half is promised in the present fiscal year. In this bibliography, however, the writings of American economic entomologists only are mentioned, and the list is only carried down to 1889. As it happens, the period of greatest activity on the part of American workers in this line of investigation is coincident with the year at which this bibliography stops. The necessity for rapid record of published writings, arranged in such a manner that the articles upon any one species may be ascertained with a minimum of labor, is therefore much greater than ever before. Active work in this direction, therefore, has been begun. The work is being done upon catalogue cards, and is arranged in such a way that a transcript at any period will furnish manuscript for a bulletin or a volume covering the interval.

(g) A necessary supplement to the purely economic work of the division is a certain amount of monographic work upon the groups of insects which are most nearly related to agriculture. The condition of our knowledge of North American insects at the present time is such that many forms which spring into prominence as destructive species are found to be new to science. They must be classified, described, and given names before they can be intelligently considered in economic publications. This work must be done comprehensively and upon entire groups in order to be most available to workers. Therefore several competent assistants of the division are working in the intervals of their perhaps more important and directly economic work at monographic papers upon such groups of insects. One assistant has nearly completed an elaborate monograph of the *Pteromalinae*, a subfamily which contains forms parasitic upon destructive insects; another assistant has been similarly working upon certain groups of sawflies, and a third upon several groups of two-winged flies.

WORK PROPOSED FOR THE CURRENT FISCAL YEAR.

The scientific investigations which will be carried on in this division during the current fiscal year are in the main continuations of those already mentioned as having been begun during the past fiscal year. This is principally due to the fact that investigations have to be planned during the dormant season and begin usually with the springtime, whereas the fiscal year, beginning with the 1st of July, comes in the middle of the work. The work on insects affecting the orange, on insects affecting stored products, on insects affecting shade trees, on experiments with insecticides and insecticide machinery, on the Mexican cotton-boll weevil, and on the bibliographic scheme just outlined, will be carried on through the year. Some further investigations will be made of the extent of ravages by grasshoppers or locusts, principally in the Western States, in order to assist in predicting the condition of affairs for the summer of 1896. Other lines of investigation will suggest themselves with the opening of the season of 1896.

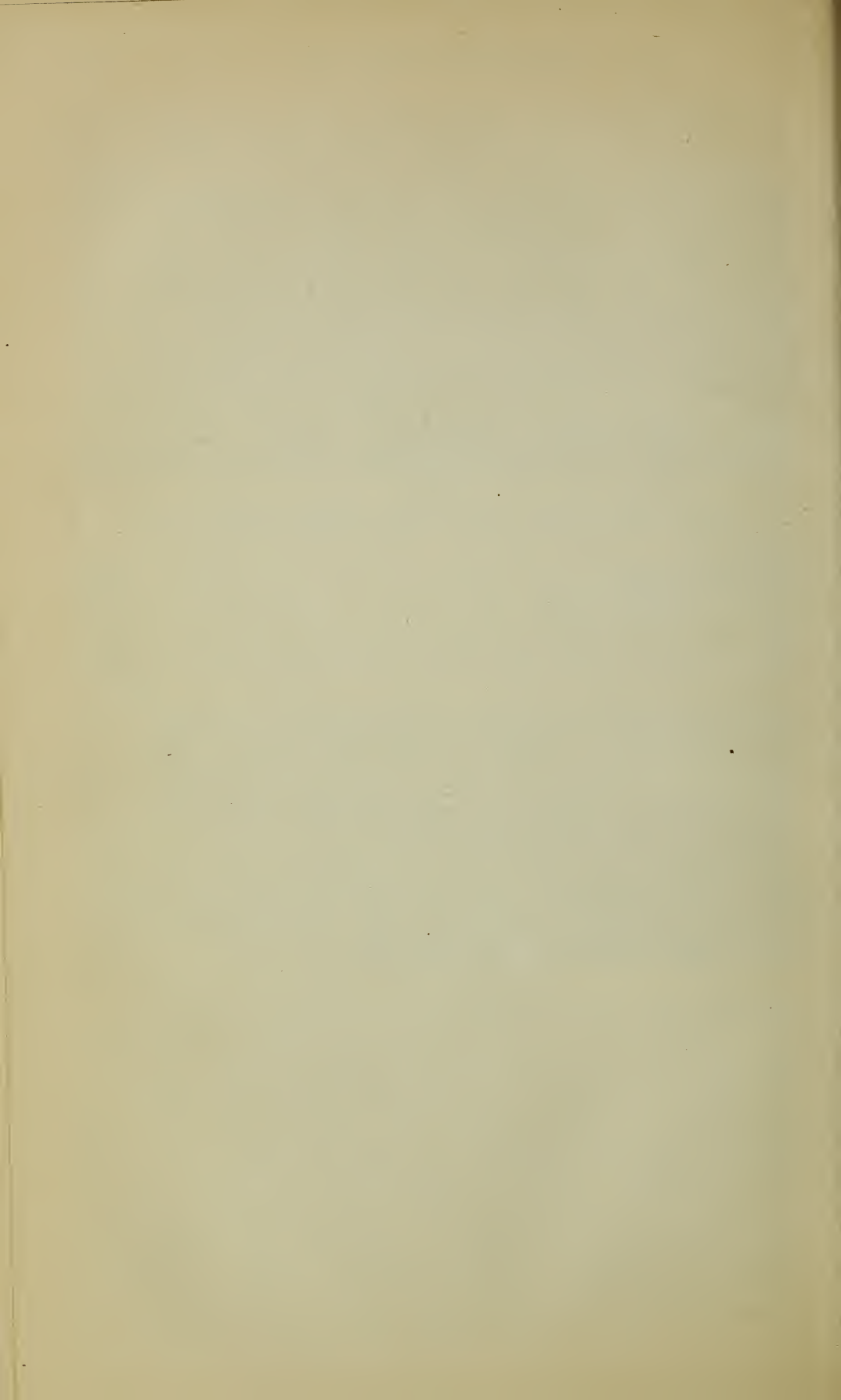
ESTIMATES FOR THE FISCAL YEAR ENDING JUNE 30, 1897.

Entomologist	\$2,500
Assistant entomologist	1,800
Assistant entomologist or clerk	1,600
Assistant entomologist or clerk	1,400
Assistant entomologist or clerk	1,200
Clerk	1,200
Clerk	1,000

10,700

Investigating the history and habits of insects, Division of Entomology; promotion of economic entomology; investigating the history and habits of insects injurious and beneficial to agriculture, arboriculture, and horticulture; experiments in ascertaining the best means of destroying the injurious ones; publishing reports thereon; for compensation of additional temporary agents of the Division of Entomology; and for illustrations, insecticide apparatus, chemicals, and traveling and other expenses in the practical work of the Division of Entomology..... 20,000

In explanation of the above.—The only difference between this estimate and the one submitted a year ago is that an additional assistant entomologist at \$1,200 per annum is asked for. The employment of such an assistant appears to the Entomologist to be an absolute necessity in order to carry on the lines of work planned.



REPORT OF THE CHIEF OF THE DIVISION OF BOTANY.

SIR: I have the honor to submit herewith my third annual report as Botanist of the Department of Agriculture, for the year ending June 30, 1895.

Respectfully,

FREDERICK V. COVILLE,
Botanist.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE YEAR.

As indicative of the relative amount of money expended for investigations in this and the two preceding years, it may be said that from the roll of the Division of Botany in June, 1893, it appears that 35 per cent of the money expended for salaries was devoted to investigations; the remainder to clerical and mechanical labor. In June, 1894, 42 per cent was devoted to investigations, and in June, 1895, 57 per cent. It is believed that by securing for the botanical work of the Department trained investigators the results will be much greater in proportion to the money expended than when the work is carried on more largely by clerical assistants. In accordance with this idea, all new positions and all vacancies have, as far as possible, been filled through special technical examinations held by the Civil Service Commission.

I wish to say in this connection that an experience of seven years, first as an assistant in this division, later as its chief, enables me to say without reservation that the civil service examinations have been a positive success in assisting the department authorities to make the best selection from several candidates for a vacancy. Of six positions filled in this way during the year, each requiring a good general education and a special knowledge of the technique of botany, all were secured by persons who had spent from four to eight years in training for such work, and the quality of the service rendered, which is the final test of any plan of selection, fully justifies this system. I believe it to be far superior to selection based on personal recommendation, whether made by public officers, by private citizens, or by college professors, when not supported by an actual examination of the candidates themselves.

HERBARIUM.

Since the National Herbarium in the custody of the Department of Agriculture had outgrown its available quarters, since it was not in a fireproof building, and since the space it occupied was needed for other

purposes by the Department of Agriculture, the Secretary of Agriculture entered into correspondence with the Secretary of the Smithsonian Institution with a view to the transfer of the herbarium to the National Museum building, and satisfactory terms having been made the Botanist of the Department was directed to effect the transfer. This was completed November 1, 1894, room having been provided for about three-fourths of the herbarium, the remainder being still housed at the Department of Agriculture. The details of this transfer are given more fully in my report as honorary curator of the department of botany in the National Museum, as is also the detailed report on the condition, accessions, and management of the herbarium.

WEEDS.

Mr. L. H. Dewey, one of the assistant botanists, has continued his investigations of weeds, paying particular attention during the year to the Russian thistle, nut grass, and live-forever. The largely increased demand for information regarding the Russian thistle has been supplied by the publication of Circular No. 3. The Division of Botany has been instrumental in bringing to the attention of State authorities the advent of the Russian thistle in certain Western States and in pointing out to them the necessity of at once providing means for its eradication. An appreciative response has been made in some cases, particularly in California, where immediate steps were taken by the State experiment station to prevent the spread of the weed, a special agent being employed to inspect the railroad properties and indicate to the authorities all places in which the plant had already obtained a foothold. A circular on nut grass has been issued and distributed widely throughout the Southern United States, where this plant is a most pernicious pest in cultivated fields. The weed known as live-forever (*Sedum telephium*) in the New England and Middle States, which often renders large areas of meadow land almost worthless, was investigated with a view to the wider dissemination of knowledge regarding a disease which in certain localities is known to have entirely killed out the plant. An interesting report on this subject will be forthcoming during the ensuing year. Information respecting all the different weeds of the United States is gradually being accumulated, with a view ultimately to the publication of an illustrated handbook on the subject, prepared for the special use of farmers. A partial report of this nature has been issued as Farmers' Bulletin No. 28, entitled Weeds; and How to Kill Them. In addition to illustrations and special remarks regarding some of the weeds, is given a tabular arrangement of the most important facts, from a practical standpoint, concerning about one hundred of our commoner species, with brief instructions as to the best methods for their eradication. A bulletin has also been prepared on the subject of weed legislation, consisting of a compilation of the weed laws now in force in different States, and suggestions for similar legislation by other States.

PURE SEED.

The laboratory for pure seed investigations has been removed from the main building of the Department of Agriculture to a brick dwelling house, 212 Thirteenth street SW., which has been fitted up for laboratory purposes, and assigned in part to the Division of Botany. The equipment for investigation has been materially improved by the increase of the seed collections, which at the close of the year contained

a total of 7,528 specimens. Fourteen hundred of these specimens were purchased from Mr. P. Hennings, of Berlin, Germany, and are especially valuable in the identification of impurities in imported seed. The other specimens have been obtained by collection and by exchange with both foreign and American botanists and botanical institutions. Several new and valuable pieces of apparatus have also been added to the laboratory equipment.

In view of certain foreign representations regarding the alleged impurity of American clover seed, made, evidently, with a view to discredit the excellence of our exported product, correspondence was entered into with the principal clover-exporting firms of the United States relative to the feasibility and necessity of an official clover inspection at ports of shipment. It was found that a detailed inspection would present decided difficulties, perhaps insurmountable, seriously interfering with the present methods of shipment. Furthermore, the agrarian spirit in those European countries in which protests have been made against American seed would be little, if at all, affected by any inspection, however exacting and conclusive. In view of this condition of affairs, no official inspection of clover seed was recommended to the Department authorities.

Our special investigation of clover seed, begun late in the preceding fiscal year, has been continued. A circular letter asking for detailed local information has been sent to the statistical agents of the Department, and the facts thus elicited have been tabulated for use. A personal inspection of the methods of handling and growing seeds has also been made in Baltimore, and in the States of Ohio and Indiana. Numerous samples of clover seed have been obtained from producers and dealers in different parts of the country, which will form the basis of germination and purity tests, to be conducted during the coming year.

The seeds purchased by the Department of Agriculture for distribution in the fiscal year 1895 have all been submitted to purity and germination tests, the number of these tests reaching 717 and involving the separation and counting of over 120,000 seeds, a fact which may give some idea of the painstaking care required in conducting such an investigation. Many of the varieties showed a surprisingly low per cent of germination and several cases of evident fraud were detected.

The greenhouse facilities that were recommended in my last annual report have been provided, consisting of a space of about 720 square feet in one of the Department greenhouses. This was ready for occupation in the last week of the year.

POISONOUS PLANTS.

In my last annual report I pointed out the desirability of investigating the poisonous plants of the United States for purposes of popular information regarding their identification, poisonous effects, and proper antidotes. This work was commenced in November, 1894.

A collection of crude drugs to the number of nearly 400, representing about 300 species of plants, has been contributed by Messrs. Parke, Davis & Co., Detroit, Mich.; Stearns & Co., Detroit, Mich.; Lloyd Bros., Cincinnati, Ohio; Gilpin, Langdon & Co., Baltimore, Md.; Burrough Bros., Baltimore, Md., and Merck & Co., of Darmstadt, Germany. The specimens are accompanied in most cases by chemical products or extracts and are invaluable in the identification and comparison of poisonous and medicinal plants sent to the Department for examina-

tion. The library of the Department has been increased by the purchase of several of the more important pharmacological publications, and a large amount of bibliographical work has been done in bringing together in convenient form for ready reference information relative to our native poisonous plants.

The first subject of investigation taken up has been that of laurel poisoning. A résumé of all published information on this topic has been made, some chemical and physiological work carried on for the purpose of elucidating certain doubtful points, and a report on the whole subject submitted. Incidentally work has been done upon two other plants, the western leatherwood (*Dirca occidentalis*) and a native weed of the southwestern United States (*Datura meteloides*), both of which contain poisons.

GRASSES AND FORAGE PLANTS.

The work on this subject is in charge of Prof. F. Lamson-Scribner. The reports in preparation on grasses and forage plants have been continued, the efforts of Professor Scribner and his assistants being devoted particularly to an illustrated descriptive publication on the grasses of the United States. Circulars on the Flat Pea and Sachaline have been issued, and a paper on "Grasses as sand and soil binders" was prepared for publication in the Yearbook of the Department for 1894.

By action of the last Congress the work upon grasses and forage plants has been separated from the Division of Botany and placed in charge of a newly created Division of Agrostology, this arrangement having taken effect July 1, 1895.

FIELD WORK.

During the latter half of 1894 three field agents were employed by the Department of Agriculture, one of them, upon the plains vegetation of the arid region of Oregon, lying between the Blue Mountains and the Cascade Range. This agent has presented a report upon this work, which, together with an investigation on similar lines for the plains of the Columbia, in the State of Washington, will form the basis of a general report on the plant resources of the whole subarid region of these two States after an examination of the remainder of this region south and southwest of the Blue Mountains has been made. Another agent was employed to make an examination of the flora of southern Utah and adjacent portions of Nevada and northern Arizona, for the purpose of ascertaining the plant resources of this area and of mapping its plant zones. A partial report on this subject has been submitted by the agent in Alaska, who continued his work during the season of 1894 in the interior, and returned to Washington with his collections late in October. He has since submitted a report on his work in that region.

EDITORIAL WORK.

During the fiscal year 1893-94 several reports were submitted to the Botanist, with a view to their publication, but in the absence of sufficient time for editorial work it was impossible to give them their final preparation for the printer. In order to expedite the publication of these reports, an editorial assistant was asked for and allowed. During the year this assistant has edited, in connection with the Botanist,

seven reports besides several circulars and briefer articles, and has read the proof of all publications issued, besides attending to other bibliographical work of the division.

LIST OF PUBLICATIONS.

The following publications have been issued during the year:

- Report of the Botanist for 1893. By Frederick V. Coville. Issued August 27, 1894. 8°, pp. iii, 235-244.
- Circular No. 2. Nut Grass. By Lyster H. Dewey. Issued October 27, 1894. 8°, pp. 4, fig. 1.
- Circular No. 3. The Russian Thistle. By Lyster H. Dewey. Issued January 4, 1895. 8°, pp. 8, figs. 3.
- Contributions from the United States National Herbarium, vol. 1, No. 9. Report on a Collection of Plants Made in the States of Sonora and Colima, Mexico, by Dr. Edward Palmer, in the years 1890 and 1891. By J. N. Rose. Issued January 31, 1895. 8°, pp. v, 293-434; pl. xiii, figs. 10. Title page, preface, and index to vol. 1, pp. viii.
- Bulletin No. 16. American Ginseng: Its Commercial History, Protection, and Cultivation. By George V. Nash. 8°, pp. 16, figs. 2. Issued February 25, 1895.
- Circular No. 4. The Flat Pea. By F. Lamson-Scribner. Issued March 8, 1895. 8°, pp. 7, figs. 2.
- Circular No. 5. Giant Knotweed, or Sachaline. By F. Lamson-Scribner. Issued March 9, 1895. 8°, pp. 4, figs. 3.
- Farmers' Bulletin No. 28. Weeds; and How to Kill Them. By Lyster H. Dewey. Issued May 18, 1895. 8°, pp. 31, figs. 11.
- Report of the Botanist for 1894. By Frederick V. Coville. Issued May 28, 1895. 8°, pp. iii, 161-166.

CORRESPONDENCE.

The correspondence of the Division of Botany was much increased during the year, notwithstanding the fact that a much larger proportion of letters than heretofore has been answered by the sending of suitable printed circulars and reports. The number of letters actually written, however, is 4,557, in addition to several thousand circulars, formal answers to requests for publications, etc. Several thousand specimens of plants were received for identification, representing weeds, poisonous and medicinal plants, and supposed useful plants of many kinds.

FOOD PLANTS.

The Botanist has been gradually bringing together information on the native food plants of the United States, besides data concerning some of the foreign species seemingly capable of cultivation in this country, but not as yet commercially known here. In order to increase the amount of good to be derived from this source, it is very desirable that opportunity be furnished for growing in some suitable place on the Department grounds a collection of such of these food plants, either native or foreign, as give promise of agricultural utility. The special object of this work is not so much to discover plants which are likely to prove staple crops as to point out what plants are useful for local and domestic purposes in diversifying and improving the dietaries of the agricultural classes. Most of the plants which would come under this head do not give sufficient promise of general commercial value to lead seed dealers to pay any special attention to their introduction and cultivation.

CORRELATION OF VEGETATION WITH SOILS.

The Department has undertaken through its Division of Agricultural Soils to point out the mechanical characteristics of the soils best adapted to the cultivation of particular crops, and to indicate by geographical descriptions or by maps the localities in which these soils may be found. The usefulness of such results may be much extended by ascertaining and describing the differences in the natural vegetation of these various soils so as to enable farmers to identify them the more easily. The presence or absence of certain kinds of trees or other plants may thus often inform a prospective owner, tenant, or immigrant of the precise capacity of the land he is examining. It is urged that this correlation of vegetation with soil be undertaken by the Division of Botany in cooperation with the Division of Agricultural Soils.

BOTANICAL ARTIST.

One of the most serious drawbacks encountered in the preparation of reports is the difficulty of securing good drawings of plants. The nature of this work is such that large orders can not be made in advance, while the routine of securing contracts is so slow and subject to such technicalities that small lots of drawings satisfactorily executed can with difficulty be obtained. Several hundred drawings are needed to illustrate reports now in preparation—reports the contents of which, on account of the technical nature of descriptive botanical language, would be largely unintelligible to farmers if issued without illustrations. An effort should be made to secure and retain on the permanent roll a skilled botanical draftsman.

REPORT OF THE AGROSTOLOGIST.

SIR: I have the honor to submit my first annual report upon the work of the Division of Agrostology for the past fiscal year, together with an outline of the plans of the work for the current fiscal year and suggestions for the future, presented in accordance with your letter of instructions under date of July 22.

Respectfully,

F. LAMSON-SCRIBNER,
Agrostologist.

HON. J. STERLING MORTON,
Secretary.

ESTABLISHMENT AND SCOPE OF THE DIVISION.

Through the recommendations and earnest efforts of the Secretary of Agriculture a law was passed by the last Congress establishing the Division of Agrostology. In accordance with this act the division was organized July 1, 1895, at which time the law went into effect. The work of the division will be entirely devoted to grasses and forage plants, both of this and other countries, the investigations of those of the latter being made with a view of introducing the best kinds into the United States. The grasses will be studied scientifically as to their kinds and distribution, their economic value in agriculture and the arts, the adaptability of the different kinds to special uses or to various soils and climates. As has already been announced, this new division will instruct and familiarize the people with the habits and uses of all grasses and forage plants by correspondence, reports, illustrated circulars of information, bulletins, and special monographic works relating to the subject.

GRASSES AND FORAGE PLANTS—VALUE.

There is no other country the natural resources of which, counted in the number of species of nutritious forage plants, are equal to our own. Among these plants the grasses are the most important, since they provide food for man and forage for cattle, and next in importance is the bean family, which includes all our cultivated clovers and their relatives—alfalfa, cowpeas, lupins, and a multitude of less known species. Of the former there are about 700 distinct species native to the United States and more than 800 kinds of the latter, together forming one of the richest legacies of our country.

There are no finer natural meadows and pastures in the world than are to be found in many sections of our land. They abound in the Appalachian Mountains and cover the prairies from the Saskatchewan to the Gulf, and are present in the mountain valleys and on the plains of the Pacific Coast.

Every year increasing attention is being given to the raising of improved hay and fodder plants, and the importance of our hay crop is being realized more and more in commercial circles, evidenced by the calling of conventions for the establishment of uniform grading and regulations which will place the handling of hay upon a basis similar to those upon which rest dealings in cereals and other staples. The official estimate of the value of our hay crop for 1894 is very nearly half a billion dollars, and this with an average production per acre of 1.14 tons. A little effort, or a little more intelligent selection of the hay plants cultivated, might have increased this average production per acre to 2 tons, which would have added 41,396,483 tons to the total crop of that year, or an increase in money value, based upon the low average price of \$8.54 per ton for 1894, of \$353,575,090. The same increase in value of the product might also be secured by improving its quality through judicious selection of the variety of plants cultivated.

This estimate of the value of the hay crop gives us only a partial idea of the real value of the grasses to the country. The amount of pasturage these plants afford our flocks and herds has never been estimated and its value hardly noted. But, taking the country as a whole, it must greatly exceed the value of the hay crop, for in the great grazing regions of the West the native grasses and fodder plants that cover the prairies and the foothills of the mountain ranges form nearly the entire subsistence of the stock of the ranchmen.

FODDER PLANTS FROM FOREIGN SOURCES.

Many of the plants sown in foreign meadows have no value with us, however much they may be prized in their native countries, and yet they are persistently advertised and offered for sale here because they may be deemed valuable in England or Germany. Enough money has been spent by American farmers for worthless fodder plants from foreign sources to more than pay the expenses of the Department of Agriculture for a whole year. We have better species and more of them, natives of the soil, which we will not have to plant ten or twenty years to get acclimated or to learn whether they are adapted to our lands. There are 60 native clovers, 65 different kinds of blue grass, more than 90 lupins, nearly half a hundred vetches, and bunch grasses, buffalo grasses, brome grasses, meadow grasses, pasture grasses, and hay grasses almost numberless, suitable to every kind of soil and climate and rock formation which we possess. Of all this wealth of species less than a dozen so far have been brought into cultivation. There is no better and more profitable line of work open to the Department of Agriculture than the development of our resources embodied in the richest grass flora of the world. If a good forage plant can be found which may be substituted for a poorer one it may mean that two hundred head of cattle can be pastured where only a hundred were fattened before. If one grass or one clover valuable for forage can be found that will thrive in the arid lands of the West and will grow there as well as the sagebrush and creosote bush now do, many times the cost of all experiments will be added each year to the material wealth of the nation. With all our natural resources in this line we are permitting our native grasses and clovers to be driven out by foreign species, not because these possess any superiority of digestibility or nutritive value, but through indifference or overconfidence in the advertisements of parties interested in foreign products.

All the cultivated grasses and clovers of which we know the history have been cultivated in a small way at first. They are mostly species which have a large or conspicuous seed head. These were selected

and cultivated mainly because their seeds were large enough to attract attention or because the seed could be easily shelled.

The grasses and native forage plants of all descriptions should be thoroughly tried on the different soils and in the different sections of the United States. We want to know what plant will provide the greatest amounts of the most nutritious forage in the shortest season at the least expense to the farmer. We want to know what forage plants remove the greatest amounts of mineral fertilizers from the soil and what improve the fields they are planted upon. In short, we want the best, and we believe that the best can be grown on American soil from native species.

WORK IN PROGRESS.

During the fiscal year ending June 30, 1895, a beginning in the work contemplated by the division had already been made under the Division of Botany. In accordance with the directions of the Secretary, two experimental grass stations were established early in the spring, one of comparatively small area, upon the Department grounds, designed particularly to bring under direct and constant observation the numerous native and cultivated grasses and fodder plants for the proper investigation of their nature and peculiar habits of growth, and one at Knoxville, Tenn., of larger area, where the more promising forage plants, or those believed to be best adapted to our Southern States, can be grown on a scale sufficient to test their capabilities under cultivation, and furnish seeds or roots for distribution when found desirable. About 400 different varieties of grasses and forage plants have been grown during the present season at these stations. Of the pasture grasses cultivated, the true buffalo grass of the Western plains has been a most marked success. From a few roots obtained in the spring from Nebraska there has been formed a dense and pleasing turf of the finest herbage completely covering the plot assigned to it. In its habit of growth this buffalo grass closely resembles that of Bermuda, and as it will endure in more northern latitudes it may prove as valuable in our Northern and Western States as the Bermuda is in the South.

All the correspondence relative to grasses and forage plants is referred to this division, and 525 letters were answered during the year 1894-95, and a number of collections of grasses named, numbering over 1,400 identifications. The nature of the correspondence is varied, and covers a wide range of topics, from requests for the name of a single specimen submitted to the most complex questions relative to the adaptation of species for special soils or purposes or of mixtures best suited for particular soils or places throughout the country. Correspondence was opened through the State Department with our consuls in foreign countries, and much valuable information and useful material was gathered through this source. I would particularly mention a collection of 150 different varieties of grasses and grass seeds received from the director of the seed control station at Zurich, and a nearly complete set of New Zealand grasses, presented by the secretary of the New Zealand department of agriculture, and an interesting collection of the grasses and fodder plants of Italy. Over 2,000 sheets of mounted specimens, many of which are new to the collection, have been added to the herbarium of grasses. Work was begun and considerable progress made in the preparation of two reports upon the grasses of North America, one of which, popular in character, is designed to serve as a useful

reference book for farmers and others interested; the other, a larger and more comprehensive work, is designed to embrace descriptions and illustrations of all the grasses of North America, to be called "Hand-book of Grasses."

Since the 1st of July the work already begun has been carried forward with energy. A special detail was made for the investigation of the grasses and forage plants of the Southeastern States, both for the purpose of collecting information relative to this region and material for the collections of the Department and for exhibition at the Exposition at Atlanta. This field work has been completed, and a report upon it is already in the hands of the printer. The two agents appointed to work in the Rocky Mountain region have made an exceedingly valuable collection of specimens and seeds of the grasses of the region covering portions of Montana, Idaho, Colorado, and Nebraska, and it is believed that their report will be one of much value. A member of the force has been detailed to visit certain portions of the prairie regions of Iowa, Kansas, Nebraska, and Dakota with a view of preparing a report upon the "forage conditions, actual and prospective, of the prairie region." The grass gardens already referred to have been maintained with success, and, although so recently established, have been a source of considerable information.

Publications.—The publications which have been made by this division during the past and present fiscal year are as follows: Farmers' Bulletin No. 18, Forage Plants for the South, 30 pages, 17 illustrations; Circular No. 1 B, Hungarian Brome-Grass, 4 pages, 1 illustration; Circular No. 4 B, Flat Pea, 7 pages, 2 illustrations; Circular No. 5 B, Sachaline, 4 pages, 3 illustrations; Circular No. 1, A Note on Experimental Grass Gardens, 4 pages; Farmers' Bulletin No. 31, Alfalfa or Lucern, 23 pages, 3 illustrations; Bulletin No. 1, The Grasses of the Southeastern United States. The most important ones now in preparation are those mentioned above, the illustrated handbook, and the general work of economic interest.

RECOMMENDATIONS.

I would recommend the continuance of the work already begun, the enlargement of our collections, both of native and foreign grasses, in the herbarium and in the grass gardens. If practicable, I would suggest that the grass garden upon the Department grounds be enlarged in order to accommodate a greater number of species, to give more area to those which exhibit marked economic value, and to afford opportunity to cultivate the same grass in a variety of ways when it may be desirable to determine both its turf-forming qualities and capacity for hay production. I would urge the further collection of seeds of our native grasses and other native plants of possible agricultural value, especially those of the semiarid regions of the western and southwestern portions of our territory, in quantities sufficient to cultivate at one or more of the grass stations immediately under the direction of the Department and at some of the State experiment stations where attention is given to this subject.

Recommendations for the organization of the division force and estimates for the fiscal year ending June 30, 1897, have been submitted.

I would finally recommend that a careful exploration be made of portions of the States of Oregon and Washington for the purpose of gaining a more definite knowledge of the native fodder plants of that region. There are very many grasses peculiar to this part of the country which are evidently worthy of the attention of the farmer and ought to be brought into notice.

REPORT OF THE CHIEF OF THE DIVISION OF VEGETABLE PHYSIOLOGY AND PATHOLOGY.

SIR: I have the honor to submit herewith a report giving a brief synopsis of the work of this division for the fiscal year ending June 30, 1895, and an outline of the work planned for the current fiscal year.

Respectfully,

B. T. GALLOWAY,
Chief.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE DIVISION FOR THE FISCAL YEAR ENDING JUNE 30, 1895.

In accordance with the recommendation made in my last report, the work of the division now includes plant physiology. Plant physiology, the study of normal life processes of plants, is so closely connected with pathology the study of abnormal life processes, that it is difficult to separate them. The latter is a comparatively new subject in this country and little attempt has been made to account for many of the phenomena involved, except on purely superficial grounds. Many of the diseases of plants are associated with the attacks of parasitic organisms, such as fungi. In cases of this kind it is customary to study the fungus only, losing sight of the fact that the environmental conditions to which the plant is subjected are fully as much if not more important than the mere knowledge as to the various phases in the development of the parasite. The division has already naturally given considerable attention to physiological questions in their relation to pathology, and it is believed that by broadening this work the practical value of the investigations will be materially increased.

As heretofore, the investigations of the division were carried on in both laboratory and field, the laboratory work being conducted principally at Washington, D. C., Eustis, Fla., and Santa Ana, Cal. The opportunities for investigations of this kind at Washington were considerably improved during the year by the removal of the division into new quarters. The new rooms were fitted up and occupied in February, and are better lighted, better heated, and better adapted in every way for the work than those formerly used. The facilities of the division were also further improved by the addition of considerable greenhouse space. It has been difficult heretofore to satisfactorily carry on many of the studies of plant diseases and their treatment on account of not being able to satisfactorily control important conditions, such as light, heat, moisture, etc. With properly constructed greenhouses this can in a measure be done, thereby making it possible to do much better and more reliable work.

INCREASED PRODUCTIVENESS OF PLANTS SPRAYED WITH BORDEAUX MIXTURE.

Studies to determine the cause of the increased productiveness of plants sprayed with Bordeaux mixture were continued as outlined in my last report. This work has an important practical bearing, and while many points of value were brought out, a number of others remain to be determined. The results of this work carried on during the year in both laboratory and field substantiate former statements in regard to the beneficial effects of the preparation in question, aside from the mere fact of its preventing injuries by fungi and insects. Whether the effects are due to an active stimulation of the plant or the indirect action of the preparation on the soil has not been fully determined.

DISEASES AFFECTING GREENHOUSE PLANTS.

The importance of the horticultural interests of the country, especially those relating to the growth of plants in greenhouses and the fact that such plants are subject to many serious diseases, made it desirable to begin a series of investigations to obtain information on the causes of the more destructive maladies and the most important means of preventing them. This work was commenced near the close of the fiscal year, the principal disease considered being one affecting the Easter lily, a plant extensively grown by florists during the winter months for its flowers. The bulbs of this lily are grown in Bermuda and are shipped here in large quantities, to be forced during the winter months. Of late years the disease in question has seriously interfered with the profitable growing of this crop, and the investigations under way are designed to obtain information as to the cause or causes of the trouble and the most practical means of preventing the same. In investigating this matter the whole question of the cultivation of the bulbs must be considered, as the disease is a very obscure one and is doubtless largely influenced by the conditions under which the bulbs are propagated, grown, and harvested. From the evidence at hand it seems probable that the bulbs, which are now all imported, and which cost the American growers many thousands of dollars annually, might be grown in certain parts of our own country. Studies of other diseases affecting plants under glass were also commenced, the more important ones being those attacking the violet, carnation, and chrysanthemum.

PEAR-BLIGHT INVESTIGATIONS.

The work on pear blight was continued during the year, the principal time of one assistant being devoted to the subject. It is gratifying to announce that the complete life history of the organism causing blight has now been worked out, and for the first time it becomes possible to control the disease. An extensive experiment to test the practical value of the recent scientific discoveries was completed during the year, the results being highly satisfactory. The assistant in charge of the work has devoted a considerable part of his time to the preparation of a report covering the results of his investigations. In connection with this work a number of other diseases affecting the pear and apple were made the subject of study, the object being to eventually bring the results of these investigations together in a report on the maladies affecting pomaceous fruits.

MELON DISEASES.

Reference was made in my last report to certain diseases of melons which were being investigated. These maladies, which have been very appropriately named "wilt diseases" by the assistant in charge of the work, are widespread and destructive. A number of other plants, notably the potato, tomato, eggplant, and cotton, are severely injured by the same trouble. The diseases, which cause the affected plants to first wilt and then die, are due in part to bacteria and in part to fungi. Although the effects of the attacks of both classes of organisms are the same, the manner in which they work is different. The studies during the year were made to discover the manner in which the plants are infected, how the organisms live over winter, and the relationship of the different forms to each other. Special attention was given to the wilt as affecting sea-island cotton. This crop is a valuable one and a special effort was made to obtain information which would suggest means of preventing the serious losses occasioned by the disease. It was found that the fungus causing the wilt of cotton also occurs on cow-peas, which crop is largely used for green manure. It is possible that by modifying the methods of planting and using crops not subject to the disease for green manure the maladies may be checked. These matters are now being investigated.

CEREAL DISEASES—FIELD WORK.

During the early part of the year the time of the assistant in charge of cereal diseases was spent in making field observations in the principal wheat regions of the country. These observations, together with specimens of rusted and healthy grain, previously received from thousands of correspondents all over the country, furnished much necessary information concerning the kind and distribution of cereal rusts, their relative abundance, comparative damage caused by each, and the susceptibility of different varieties to the parasites. No experiments to determine the rust resistance of different varieties having ever been made in this country, it was decided to conduct a number on a large scale and covering sufficient time to definitely decide the matter either favorably or unfavorably. Accordingly 865 varieties of wheat and 110 varieties of oats, obtained from every continent, were tested for this purpose at Garrett Park, Md. The most common species of wheat rust, the dark yellow leaf form, happened to be extremely abundant this season at the place where the work was carried on. The results of the experiments may be briefly summarized as follows: (1) The one-berried and two-berried spelts from Germany were absolutely rust free. These varieties are not used in bread-making, however. (2) Nearly all Durum wheats originating in the Mediterranean regions were almost entirely rust free. These are not considered bread wheats, although there certainly is not yet sufficient evidence that they can not be used successfully for such purpose. (3) Of the true bread wheats quite a number of the harder varieties showed rather strong rust resistance, while many of the softer and white-grained varieties were from 95 to 98 per cent rusted. (4) The rust, even where most abundant, seemed to do very little if any damage, except, of course, to make the straw less valuable. (5) Several varieties considered to be quite rust resistant in other places were here severely rusted. (6) Wheat mildew was extremely abundant on the young plants, possibly doing fully as much damage as the rust, and usually attacked the varieties most affected with rust. (7) Oat-leaf rust was present in small quantity near harvest

time, but not sufficiently abundant to show valuable comparative results. While the field work was under way laboratory experiments were carried on to determine the facility of transporting the same rust species from one host plant to another. These experiments furnished some interesting data. Experiments with spore cultures and in plant physiology were made to some extent.

WORK AT THE SUBTROPICAL LABORATORY.

During the year the two assistants stationed at the Subtropical Laboratory in Florida gave a considerable part of their time to the preparation of a bulletin on the principal diseases of citrous fruits occurring in the State. This bulletin, which will appear in a short time, gives a brief and concise account of the principal diseases affecting citrous fruits and the best methods of combating them. It is hoped that it may prove useful in enabling the grower to recognize the different diseases easily and quickly, at present a very difficult matter, owing to the lack of good descriptions and illustrations. In addition to the publication mentioned, another bulletin has been prepared on sooty mold, giving the results of extensive field and laboratory work carried on for the past two years. Incidentally some very important fungous parasites of the injurious scale insects have been found. As they are likely to prove of considerable value to the orange grower, their life history has been studied in some detail. A considerable number of laboratory and field experiments were made on Bordeaux mixture and sulphur washes. A clear understanding of the chemical and physical nature of these important fungicides has been obtained, and as a result methods have been discovered by which they can be prepared in any quantity more easily and more quickly than by the old methods. During the year studies of the diseases of the pineapple and mango were begun. The cultivation of these two plants is rapidly extending, and probably in a few years they will stand next in importance to citrous fruits in the subtropical parts of the country. The two unprecedented freezes of December 29, 1894, and February 8, 1895, caused widespread damage in Florida to many cultivated plants. The effects of these freezes have been made the subject of extended field work, the object being to obtain information that will be of value in the future planting of citrous and other fruits.

WORK ON THE PACIFIC COAST.

On the Pacific Coast the principal work during the year was on the diseases affecting the peach, almond, apricot, apple, and grape. As outlined in my last report, the assistant in charge of this work carried on extensive experiments in the treatment of peach-leaf curl. This work was completed, with very satisfactory results, and a report is now being prepared. The work on coulure (the premature fall of grape flowers) was also continued during the year practically along the lines laid down in my last report.

EXHIBIT FOR THE COTTON STATES AND INTERNATIONAL EXPOSITION.

During the latter part of the year several of the force of the division were engaged in preparing an exhibit for the Cotton States and International Exposition at Atlanta. The exhibit is one of the most complete the division has ever prepared, and it is believed that it will serve a useful purpose in illustrating the scientific and practical work under way.

ROUTINE WORK.

In addition to the foregoing, the usual routine work of the division was carried on during the year. This includes the preparation of reports, editorial work on the same, proof reading, care of indexes, correspondence, etc. Indexing the literature on plant diseases and allied subjects occupies much time, but this work is necessary and important, and therefore receives special attention. The proper care of the correspondence probably occupies one-third of the time of the entire force of the division. The inquiries received are of the most varied kind and often require much time for the preparation of full and satisfactory replies. By the use of farmers' bulletins, circulars, etc., it is often possible to answer some of the questions asked.

OUTLINE OF WORK PLANNED FOR THE CURRENT FISCAL YEAR

Work on the effects of Bordeaux mixture and other fungicides on the growth of plants is now under way and will be continued during the year. Owing to the improved greenhouse facilities, these investigations can be carried on in a more satisfactory manner than heretofore. In connection with this subject a series of experiments will be made to determine the effects of different gases in the soil on the health, growth, and productiveness of a number of plants. The highest development of a plant is dependent on perfect root development and action. These are largely influenced by conditions of the soil, the presence or absence of salts in solution, the presence or absence of certain gases, etc. Such questions have an important bearing on the health of plants and their most economic development in the broadest sense. Certain root-rot diseases, probably due to improper irrigation, have caused much trouble, especially in parts of New Mexico and California. These should be investigated with a view to remedying the trouble if possible. The work on diseases common to plants grown under glass will be continued, carnations, lilies, and violets being the principal crops considered. The question as to the practicability of growing the Easter lily bulbs in this country will be looked into. It is believed that there are sections along our Atlantic Coast where the cultivation of these and similar bulbs might prove a profitable industry.

During the fall and winter of this year it is planned to carry on extensive experiments with a view to demonstrating further the efficiency of the recently discovered method of preventing pear blight. This work will also aid the division in gaining the necessary practical experience for carrying on the work of eradication of blight on a large scale. Some of the minor points connected with the life of the organism causing blight will be worked out, the investigations being made in the greenhouse, where the conditions of heat, light, etc., will be largely under control.

The investigations of the wilt diseases of cotton and other plants will be continued, the principal object being to discover practical preventive measures.

The work on the diseases of cereals, to which reference has been made, tended to confirm previous observations, that the rust present was not the one that seriously injures wheat in this country. For this reason it is planned for the coming season to carry on field experiments to determine the rust-resisting value of wheats in a region where the destructive or black stem rust of wheat occurs. About twelve hundred

varieties of wheat and oats will be tested. At the same time the life history of the rust, which as yet is wholly unknown, will be studied in the laboratory.

Work on the effects of the two freezes in Florida will be continued, careful studies being made on the extent of the injuries caused, the relative hardiness of various cultivated plants and of different varieties of the same plant, and also on the best methods of avoiding such losses in the future. It is hoped that a preliminary report on pineapple diseases can be prepared before another year. The main part of the work in Florida, however, will be laboratory investigations on citrous fruits and their diseases. Material for these studies has been accumulating for some time, and the opportunity for uninterrupted investigation is an exceptional one, since for the most part field work will be impossible because of the severe injuries the trees suffered during the previous winter. It is probable that one of the assistants in charge of this work will go abroad for study during the year, thus leaving but one man to carry on the work.

The assistant in charge of the work on the Pacific Coast will continue the investigations of coulure. There are also a number of important diseases affecting the peach and apple which are being studied. Some time will be occupied in preparing for publication the results of the treatment of peach-leaf curl. This work was highly successful, and the report, it is believed, will be of much practical value to fruit growers.

REPORT OF THE CHIEF OF THE DIVISION OF ORNITHOLOGY AND MAMMALOLOGY.

SIR: I have the honor to submit herewith a report on the doings of the Division of Ornithology and Mammalogy for the fiscal year ending June 30, 1895.

Respectfully,

C. HART MERRIAM,
Chief.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE YEAR.

The work of the division during the past fiscal year has consisted mainly in completing investigations already under way, and in preparing reports on material collected in previous years. A number of publications on different groups of birds and mammals were completed, and have been issued and distributed, either as special bulletins or as articles in the Yearbook—the latter reprinted and distributed as separates. The subjects treated in these publications are the pocket gophers, the common crow, the food habits of woodpeckers, crow blackbirds, and hawks and owls, and the work accomplished by the division in studying the geographic distribution of life in North America. A bulletin on jack rabbits and a technical paper on shrews have been completed and will be published shortly.

GEOGRAPHIC DISTRIBUTION.

The field work necessary in running the boundaries of the several life zones has been continued. The biological survey of Montana has been extended to include the western part of the State, and will cross northern Idaho and reach eastern Washington before the close of the present season; but no biological survey on a large scale was undertaken, owing to the time required for the completion of the publications above mentioned.

Field work during the year has been carried on in seventeen States and Territories, namely: Alaska, California, Colorado, Florida, Idaho, Kansas, Kentucky, Minnesota, Montana, Nebraska, North Carolina, Oregon, South Carolina, South Dakota, Tennessee, Virginia, and Washington. The object of the work in the South was a more exact determination of the boundaries of the Austroriparian zone and the exploration of some little-known areas. Collections were accordingly made in Dismal Swamp and on the eastern shore of Virginia and also

n the Everglades of Florida. Unfortunately, the exploration of the latter region was cut short by the sudden illness of the field naturalist detailed for this duty. Some work also was done north of our boundary in the provinces of Alberta and Saskatchewan, and south of our territory in Lower California and other parts of Mexico.

The labor of mapping in detail the geographic distribution of the various species of mammals and birds has progressed slowly, owing to the pressure of other work. One clerk has been engaged almost continuously during the last four months in tabulating data for the bird maps, and the work will be pushed as rapidly as possible during the current year.

STOMACH EXAMINATIONS.

During the year 1,174 birds' stomachs were received, and 1,438 examined, in addition to a number of stomachs of mammals examined in the field. A new assistant in the laboratory was appointed February 3, since which date the work of identifying the contents of birds' stomachs has gone on more rapidly than heretofore. In determining the insect food much help has been rendered by the Entomologist and his assistants. The report on the food of crow blackbirds published in the Yearbook is based on the examination of 2,258 stomachs. The preliminary study of the food of woodpeckers has been completed and published (Bulletin 7). All the stomachs of thrushes, cat-birds, wrens, meadowlarks, orioles, cowbirds, blue jays, and mourning doves in the collection have been examined, and reports on their food habits are in course of preparation.

OTHER TECHNICAL WORK.

The technical work of revising the groups of North American mammals has progressed as rapidly as the limited time available permitted. The American shrews have been thoroughly revised, and considerable work has been done on the bats and mice. Much of this kind of work still remains to be done, and is absolutely essential in the case of groups that will form the subjects of future bulletins.

BOUNTIES.

Again it seems necessary to call attention to the pernicious effects of laws providing bounties for the destruction of mammals and birds. The temptation to expend public moneys in the hope of ridding lands of species believed to be harmful is great, and yearly leads to the enactment of unwise bounty laws. Instances of the unhappy results of such legislation have been given in former publications of the division. Among more recent examples may be cited the California coyote bounty act of 1891, which involved an expenditure of \$187,485, while the claims presented up to June 30, 1894, amounted to no less than \$358,615. Texas expended \$50,000 in a vain attempt to exterminate various species of mammals under the bounty law of 1891, but the cost fell so heavily on some counties that the law was repealed by the last legislature and a new one passed to replace it. During the past winter a bill to fix a bounty on the English sparrow was brought before the legislature of New York. Fortunately, through the efforts of the State entomologist and others, the measure was defeated, and the useless expenditure of a large sum of money averted. In the case of the sparrow bill, and one or two similar measures proposed in other States

during the year, the division was requested to furnish data with a view to forecasting the probable effects of such legislation. The ground-squirrel plague in the State of Washington seems to have increased in the last two or three years, in spite of large expenditures for bounties and poison. The damage done to grain crops has been immense, and numerous letters have been received from sufferers seeking means of relief. The extermination of such animals can only be accomplished by concerted and continuous efforts on the part of individual farmers and landowners. Bounties rarely accomplish, and often defeat the object for which they are intended; they are pernicious in putting a premium on fraud.

COTTON STATES AND INTERNATIONAL EXPOSITION.

Some time has been devoted to the preparation of an exhibit for the Atlanta Exposition. This exhibit is designed to serve as a suggestive illustration of the work the division is doing in studying the geographic distribution of life in North America, and investigating the food habits of injurious and beneficial mammals and birds.

ROUTINE WORK.

Routine work consumes a large part of the time of the office force and, as in former years, has consisted of correspondence, attention to the needs of field agents, the tabulation and arrangement of reports and other information received, the identification of specimens, the care of collections, the preparation of reports and bulletins for publication, and of reference lists useful in the work of the division. The number of letters received during the year was 4,025, and many of them were accompanied by schedules, reports, and notes, which were examined and filed for future reference. During the same time more than 2,500 letters were written and several hundred schedules distributed to correspondents; 368 packages were received, and 464 sent out. The demand for the publications of the division is constantly increasing and the editions of most of the earlier bulletins are now exhausted.

As a result of the continued growth of the Department, the division has been housed for about six months in a large, barn-like wooden building, in rooms utterly unsuited to its needs, where its valuable library, manuscripts, and unpublished notes, representing eleven years of arduous labor, have been constantly exposed to the danger of total loss by fire. Hence it is a matter of unspeakable satisfaction to learn that quarters have been provided in a substantial and relatively fireproof building, into which the division will be moved in the immediate future.

OUTLINE OF WORK FOR 1895-96.

The plans for the current year do not contemplate any radical departure from the lines of investigation heretofore carried on, but rather a more systematic continuation and completion, so far as possible, of work already under way. The biological survey of the northern Rocky Mountain region will be extended to the Great Basin in eastern Washington and Oregon, including a preliminary examination of the Blue Mountains, in order to obtain much needed data on the distribution of animals and plants in that little-known region. Field work will be done also in the Northwest—in the heavy rainfall belt along the coast from Oregon to southeastern Alaska. Several popular bulletins on mammals of

economic interest, similar to those already published on the ground squirrels of the Mississippi Valley and on the pocket gophers, are in course of preparation. One on the jack rabbits will include all the species of the United States, giving their distribution, the injury they inflict on crops, their value as food and for game and coursing, the purposes for which their skins may be used, and the methods that have proved most successful in destroying rabbits and protecting crops from their depredations. Other groups that will be taken up in the near future are the ground squirrels of the whole United States, the prairie dogs, marmots, and weasels. The maps already made, showing in detail the areas inhabited by various species of mammals and birds, will be brought down to date and many additional maps will be prepared. In the laboratory studies will be continued on the food of birds. One part of the bibliographic work on which the division has been engaged for several years—a list of the genera and subgenera of mammals—is now almost finished, and it is expected that the list can be completed and published in the course of a few months.

REPORT OF THE CHIEF OF THE DIVISION OF AGRICULTURAL SOILS.

SIR: I have the honor to submit herewith, in accordance with the recent order of the Secretary, a report of the work of the Division of Agricultural Soils for the year ending June 30, 1895.

Respectfully,

MILTON WHITNEY,
Chief.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE YEAR.

The principal lines of work carried on in this division during the last fiscal year were the continuation of the examination and classification of the soils of some of the principal agricultural areas in the country; the working out of methods for the study of the physical properties of soils and the effect of fertilizers thereon; a continuing of the record of the daily amount of moisture in typical soils of these different formations, and cooperating with a number of States in the study of their local soils and soil conditions.

In the organization of the division it has been extremely difficult to secure assistants with the proper training and qualifications to carry on the work. Two special examinations were held by the Civil Service Commission during the past year, but only four applicants took the first and only one the last. There has been no special training in this line of work, and it has been difficult to interest able men, who have been trained in other branches, and induce them to enter an essentially new and unexplored field. It is difficult to select men through a competitive examination for such positions, where the knowledge of the subject must be of minor consideration on account of the lack of training. The positions require men of sound judgment; training in practical as well as in scientific lines; men who have energy and determination to surmount obstacles as they appear, and who are fertile in devising methods of work; men with capacity for original thought, who can throw themselves faithfully into developing the work of the division. These are qualities which it is difficult to bring out in a competitive examination.

Owing to the impossibility of finding men trained in this line of investigation, it has been necessary to take young men at small salaries and train them for the more responsible positions in the division. An interest is now being aroused in this line of work, as is apparent from the fact that over twenty persons applied for papers for a civil-service examination recently held for two assistants in the division at a salary of \$800 each per annum.

INVESTIGATION OF AGRICULTURAL SOILS.

The examination of the physical properties of important soil formations has been continued. A large number of samples has been added to our soil collection, which now numbers over 2,100 samples, collected with care and judgment from many different localities in this country and abroad. Many of these samples have been analyzed and the typical soil conditions have been worked out for a number of important areas. A bulletin has been prepared and is now in press, showing graphically the texture of these soils, upon which the relative agricultural value of many of them depends.

METHODS OF INVESTIGATION.

It has been necessary to work out suitable methods for the study of the physical properties and conditions of the soils in the field. In studying the relation of soils to crop production and the local distribution of crops it is necessary to determine the actual conditions of the soils in the field on which the plants are growing. A large amount of laboratory work has previously been done on soils both in this country and abroad, but very little effort has been made to study the actual conditions of soils in the field. The most important physical condition which influences the relation of soils to crops is the supply of water carried throughout the season by the soil. This is apparent in the remarkable effect of changing seasons, and especially of the amount and distribution of the rainfall upon the crops in different seasons. Soils hold very different amounts of water under the same climatic conditions, owing to the difference in their relation to water. This difference is due, principally, to the texture and structure of the soil. Osborne's method of mechanical analysis, slightly modified, is used for the determination of the texture of soils. It has been necessary to work up a method for the determination of the structure of soils, which is being done. It has also been necessary to work up a reliable and convenient method for the determination of the amount of moisture in soils in the field. Great progress has been made upon this subject in the past year, and it is expected that a convenient method will shortly be perfected for the determination of moisture in the soil without the necessity of taking samples, or in any way disturbing the natural condition of the soil after the instrument has been buried.

SOIL OBSERVERS.

A regular system of soil observation is being organized by the employment of competent observers for typical soils in the principal agricultural regions of the country. More than fifty observers have reported regularly during that portion of the growing season which is of greatest importance to the crops of their respective localities. Most of these observers have reported merely upon the conditions of the soil as regards moisture. Some have observed the temperature of the soils also. The method of moisture determination as made at present by this division consists in taking a sample of the soil from the field by driving down a small brass tube, with a suitable cutting edge, to a depth of 12 inches, withdrawing this carefully, securing the ends so that the soil shall not lose water, and sending it to the Department where a moisture determination is made by the usual methods. Such samples are taken daily and curves are drawn showing graphically, each month,

the conditions of moisture in that particular soil for each day of the month. These diagrams are published from time to time, with full notes as to the climatic and crop conditions. It is expected that we shall be able to establish for the different soils normal conditions, with maximum and minimum lines above or below which crops suffer from an excess or a deficiency of water. The use of such records, with a ready means of determining the moisture conditions wherever irrigation is practiced, is obvious to anyone. It will also have an important bearing upon the time and kind of cultivation for any particular soil and crop.

We have this year studied to some extent the influence of different methods of cultivation upon the water contents of the soils, especially in the West. Records have also been kept by some of the observers of the amount of moisture at different depths, and this will probably be an important feature of the work of the coming year.

COOPERATION WITH STATES.

There have been a number of requests from different States and State institutions for advice, direction, and cooperation in the study of their local soil conditions. These requests have been complied with, wherever it has been possible, within the limits of the statutes and within the resources of the division. The Maryland Experiment Station has maintained one assistant here throughout the year, working upon the soils of that State under the direction of the chief of this division. The Virginia Board of Agriculture requested us to assume direction of some preliminary work on the soils of Virginia, and with the consent of the Secretary four men were employed by the board to work upon the soils of the State under the immediate direction of the chief of this division. The relations of the Department with the Virginia Board of Agriculture in this cooperation are fully set forth in a separate report to the Secretary. Other State institutions are seeking the same kind of cooperation in connection with their experiment station work or geological surveys.

PLANS FOR THE FISCAL YEAR ENDING JUNE 30, 1897.

The character of the work for the current fiscal year is essentially the same as for the last year, but with material enlargements of the scope of the investigations as the work of the division is systematized. It will be necessary to continue the investigation of the important areas of agricultural soils in different parts of the country and to study the texture and composition of them and the conditions they maintain, which determine their peculiar adaptation to crops. Work will have to be continued both in the field and laboratory in devising and improving methods of investigation and methods for the determination of the actual conditions maintained by soils for the use of plants.

The system of soil observations for the records of the moisture and temperature conditions of the soil should be considerably extended and systematized. One of the assistants in the division has been assigned to this work and good progress is being made in systematizing the work, in the classification and interpretation of the information received from the observers, in the preparation of the necessary forms and instructions, and in the training of the observers.

RECOMMENDATIONS.

I would recommend that the study of the conditions in the field be extended and made a permanent and very important part of the work of the division. The number of observers should be greatly increased as we become more thoroughly acquainted with the different soil areas and as the methods for studying the soil conditions are improved and simplified.

I should also recommend that provision be made for cooperation with such States or State institutions as may wish to cooperate with us, upon such terms as may be approved by the Secretary, and to an extent depending upon our resources and facilities for carrying on the work. I recommend that Congress be asked to make a small, but specific, appropriation for cooperation of this kind.

Soils must be studied according to certain great areas irrespective of State lines. It is not possible, for example, to intelligently study all the relations of the soils of the tobacco area of Pennsylvania without also studying the tobacco soils of the Connecticut Valley, Virginia, Kentucky, and other sections of our country. Then, as the Cuban type of tobacco is grown in Pennsylvania and the Sumatra type in the Connecticut Valley, and as we have to compete with each of these countries, which produce cigar wrappers of unequaled quality in some respects, it is even necessary to study the soils and the soil conditions of the tobacco districts of Cuba and Sumatra to throw light upon the soil conditions and the best methods of cultivation in Pennsylvania and in the Connecticut Valley. Such extensive investigations can not be undertaken by a private individual nor by a State institution. There are certain general principles which can only be established by the General Government, and the Department should take up these broad interstate questions, as has been done with the work of the Weather Bureau and of the Geological Survey. It is necessary for the Department to encourage, coordinate, and harmonize the work of the several States, and to do that part of the work which is beyond the range of their local conditions, while leaving all the local details of the work to be done by the States.

REPORT OF THE CHIEF OF THE OFFICE OF IRRIGATION INQUIRY.

SIR: I have the honor to submit herewith my annual report of the business of the Office of Irrigation Inquiry for the fiscal year ending June 30, 1895.

Very respectfully,

CHARLES W. IRISH,
Chief.

Hon. J. STERLING MORTON,
Secretary.

The work of this office for the fiscal year 1894-95 has been continued on the same lines as that of the preceding year. Communication has been maintained with individual farmers in all the States and Territories of the arid and sem arid regions of the country, and also with many farmers of the older States on the subjects involved in the production of crops by irrigation. There is a steady increase in the demand for instruction upon these subjects, as is shown by the correspondence of the office. The larger portion of the applications for advice still comes from the semiarid regions, ranging from Texas through all the country lying just eastward of the Rocky Mountains, between that chain and the ninety-fifth meridian.

In the older States much attention is being paid to the subject. Many inquiries come from Iowa, Illinois, Indiana, Ohio, Wisconsin, Michigan, and even some of the New England States. Investigations in the regions where irrigation is most extensively practiced have developed the fact that there is no general systematic plan of irrigation followed in this country, and that while individuals have intuitively adopted systems, the outgrowth of their own experiments, which are nearly perfect and are well suited to the conditions by which they are surrounded, by far the larger number of the farmers irrigate their crops in a haphazard way.

Out of this condition have come many theories regarding the proper quantity of water needed for the production of crops, and few persons know that each crop requires a supply regulated to produce its best growth and production. Hence it is not uncommon to find a majority of the farmers in the oldest irrigation systems applying the same quantity of water to all their crops. For the reason that those who use the water know so little about diversified irrigation, they are imposed upon in all manner of ways by those whose object it is to induce them to use a much less quantity of water for their purposes than they do use, and this is done in many cases in order that such persons and their associates may speculate in selling a larger number of water shares.

The attempt thus to attenuate the use of water in the irrigation of crops is seen in nearly all the current literature of the arid regions, and is heard in much of the talk in irrigation conventions and congresses.

There is, therefore, a great need for the distribution of reliable information on all the questions involved in the use of water for the production of crops by irrigation among the farmers who practice that mode of crop raising, or desire to do so. Many of these questions have been settled and the results are well known in Europe, wherever irrigation is practiced.

These results being the product of hundreds of years of practice, and being fortified by many physical experiments testing and upholding the truth of them, they are no longer questions for debate, but rules to be followed by all who would do effective work in irrigation farming. So far as practicable in correspondence, this office has laid before such persons as have applied to it the experience here referred to.

Personal investigation authorized by you, officially, has brought to my knowledge several methods of irrigation which seem to be models of simplicity and efficiency, especially as to the measurement and distribution of water. The great advance in these plans consists in doing away with the highly technical and complicated hydraulic formulas and the accompanying abstruse calculations, for the measurement of the flow and volume of water in canals or through orifices, notches and over weirs, substituting for such purpose tables of multipliers for each depth of pressure, whereby the area of the discharging apparatus can be multiplied by the corresponding figures of the tables, the result being the number of miners' inches or of cubic feet per second of the flow, as may be required. By this method all who use water for irrigation, delivered through the contrivances named, can, if they understand the rules of common arithmetic, themselves ascertain the volume of the water which they are using. This system, where used, has put an end to the distrust in which the farmers have always held the results of water measurements by the old technical processes.

It is readily seen that the farmer using this system of measurement and cultivation can with perfect certainty measure out the requisite quantity of water to individual crops, thus substituting an intelligent use of water for the almost universal guesswork now in vogue.

During the fiscal year just ended this office has sent out to its correspondents 2,396 letters and circulars, of which number 913 were letters of advice on irrigation subjects, 495 were upon miscellaneous subjects, and 988 were circulars written by typewriter. There were also prepared in the office and sent out by mail 307 plans, drawings, and blue prints to illustrate irrigation farm operations. Also, there were sent out by mail 553 of the Department publications to correspondents of the office asking for them.

The largest part of this work was done between October 1, 1894, and February 28, 1895.

Since copious rains have set in over the greater part of the semiarid region, there has been a notable falling off in the number of requests received by the office for advice and plans for the irrigation of farms.

By authority of the honorable Secretary of Agriculture, I made a trip of three months' duration in the States of Nevada, Idaho, Wyoming, and the Territory of Utah, carefully observing the system of farming by irrigation as practiced in those regions, and securing on the way over two hundred samples of agricultural soils for examination and analysis by the Divisions of Chemistry and Agricultural Soils.

In order that this office may more completely reach the mass of irrigation farmers of this country than can be done by means of bulletins or of correspondence, as is now the practice, I would recommend that the chief be empowered to travel through the different States having the greatest interest in the subject of irrigation, for the purpose of assisting in the organization of irrigation associations of their farmers, for the purpose of bringing them together on common ground, there to discuss the work done by themselves and others in the irrigation field. I am satisfied that this is the only practical way in which to educate those who desire to progress in the business of irrigation farming. To such organizations this office might become the medium of much important and valuable information, and thus be able to reach the largest number interested in its work in the shortest time and in the most effective manner.

The expenses of this office for the fiscal year 1894-95 were as follows:

For salaries.....	\$3, 004. 62
Miscellaneous and traveling expenses.....	682. 96
Total.....	<u>3, 687. 58</u>



REPORT OF THE OFFICE OF FIBER INVESTIGATIONS.

SIR: I have the honor to report on the operations of the Office of Fiber Investigations for the year ending June 30, 1895.

Respectfully,

CHAS. RICHARDS DODGE,
Special Agent.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE YEAR.

During the past year the public interest in both the flax and ramie industries has largely increased, and the investigative work of the office, therefore, has been chiefly directed in these channels.

The successful establishment of the ramie manufacturing industry, as well as the depression in values of Southern staples, have called increased attention to the cultivation of this plant. The Department has recognized the need of an economically successful machine to clean the fiber by conducting, in the fall of 1894, in cooperation with the Louisiana Sugar Experiment Station, a series of ramie-machine tests. At these trials considerable progress in machine construction since the trials of 1892 was demonstrated, though the ultimate result has not yet been attained. Correspondence with farmers relating to ramie has been very large, necessitating the publication of a long-deferred report on this subject, which was issued about the close of the fiscal year.

The flax experiments in the Puget Sound region of the State of Washington have been continued on a larger and more comprehensive scale, farmers in many parts of the State cooperating with the official experiment without cost to the Department. Some fine samples of straw have been submitted, but at this date the straw has not been retted, and the final results of the experiment can not be given. One immediate result of the experiments, however, has been to stimulate great interest in the growth of flax as a commercial industry in this region. Several companies are being formed and considerable area will be planted to flax another season.

An interesting commercial experiment has also been conducted by the Minnesota Flax Company with seed supplied, in part, by the Department of Agriculture, regarding which a full report will be made to the Office of Fiber Investigations at the close of the season. In both the Washington and Minnesota experiments the effort is being made to approximate the cost of producing flax in the respective sections. There has been a large demand for Farmers' Bulletin No. 27, on Flax for Seed and Fiber, which was issued in the early spring of 1895, and a second edition became necessary.

Other fibers which have been the subject of more or less general inquiry are sisal and bow-string hems, pineapple, and jute in the South, and common hemp in the North, though in the past year hemp culture has been extended to several of the Gulf States, with a promise of success.

Work has gone forward on the Descriptive Catalogue of World's Fibers, and the list now comprises some 600 species. The preparation of this work will be pushed during the coming year, as such a publication will prove an important addition to industrial and economic literature.

During the last three months of the year my time was largely taken up with preparing an exhibit of American fibers for the Atlanta Exposition, as well as with general exposition work in connection with my detail as the assistant of the representative of the Department in charge of installation.

RECOMMENDATIONS.

At the close of the year a large collection of bottle samples of cottons and other fibers, and other material, was turned over to me from the late Division of Microscopy. This material will be speedily arranged, classified, and catalogued. In this connection I would recommend a series of tests of the tensile strengths of fibers during the coming year, as this branch of investigative work is now made a part of my office.

I would also recommend a jute-culture experiment with special regard to the cost of production. Specimens of Texas-grown jute in the collection of this office show a superior fiber that could be employed in textile manufacture, and which would command a higher price in the market for this purpose than imported jute.

It is the aim of this office eventually to cover the entire field of the fiber industries with appropriate literature, in order more readily to meet the demands made upon the Department for information.

REPORT OF THE CHIEF OF THE DIVISION OF GARDENS AND GROUNDS.

SIR: I have the honor to submit the following report for the fiscal year on matters pertaining to the objects and operations of this division.

Respectfully,

WILLIAM SAUNDERS,
Horticulturist, etc.

Hon. J. STERLING MORTON,
Secretary.

The sum appropriated for this division for the current fiscal year is \$29,500; the estimate for the ensuing year is the same amount.

WORK OF THE YEAR.

The work of this division during the past fiscal year has consisted in keeping the grounds in good condition, in the cultivation and care of the plant and fruit houses, and in the propagation of plants for home use and for distribution.

Plants distributed.—The distribution consisted of 45,530 strawberry plants; 14,370 grapevines, native and foreign varieties; 2,000 privet; 2,000 camphor; 2,000 tea; 1,200 olives; 3,075 figs; 470 guavas; 650 *Citrus trifoliata*; 150 pineapples; 140 loquats, and about 1,900 miscellaneous plants, such as anona, vanilla, caper, coffee, carob, dates, bananas, mangoes, etc., in all, packed for mailing, 73,485 plants.

Propagation of olives and camphor plants.—For future distribution olives and camphor are being propagated as extensively as the present means will permit. Since the damage by frost of the citrus industry in Florida an interest has been awakened in that State toward the prosecution of other cultures less sensitive to extremes of climate. The olive is, therefore, receiving a good share of attention, as it is known to succeed under various climatic conditions—on sea coasts, and in the interior of continents. It will withstand a temperature as low as 8° F., and in localities where the summer range is as high as 100° F. or upward in the shade, and in all kinds of soils, from sands to clays. The propagation of olives by cuttings is a process which requires careful management, and is slow at best, so that the 6,000 plants, which will soon be ready, represent a considerable market value. These are propagated from a selection comprising over twenty of the most esteemed varieties both for oil production and for pickling.

The demand for camphor plants is even greater than that for olives. Since this plant endures without injury the colds that destroy orange trees, it is being advocated as a shelter plant for citrus groves. It is also planted as a shade tree in Southern cities, and as an ornamental tree for lawns it is not excelled.

The cultivation of the camphor tree for its commercial product is also being considered as an industry of some promise, and where the citrus crop is, at least, a temporary failure, a diversity of products is demanding attention, and the production and manufacture of camphor is contemplated as worthy of experiment. One thousand fine young camphor trees will soon be available for distribution.

Tea.—Inquiries for tea plants are frequently received, and a few thousand plants are annually propagated to meet these requests. It is now very well understood that tea culture for profit is exceedingly problematical, but it is favorably considered as a desirable domestic industry, and this idea is fostered so far as the yearly distribution of plants is concerned; also to afford an opportunity for further experiment by those who request plants in quantities for this purpose.

Successful culture of tea is a hygrometric rather than a thermometric question. The plant is hardy over many of the States, but the rainfall is insufficient in all of them, so that, independent of the cost of manual labor here as compared with that of Asiatic countries, a complete system of ample irrigation would be indispensable to grow the article to commercial advantage anywhere in the United States.

Photinia japonica.—This plant, known as the "loquat," grows well over most of the Southern States, has clusters of small fruits, which have an agreeable taste, and is in frequent demand. To meet these occasional requests a few hundred plants have been propagated.

Psidium cattleianum, or strawberry guava.—This plant is frequently called for; it is considered more hardy than the West India guavas, and although the fruit of the strawberry is small as compared with the above, it is in demand. A yellow-fruited variety is also much esteemed. Of these guavas over 500 plants will be prepared for early distribution.

Pineapples.—The frost of February destroyed many of the pineapple plantations in Florida, consequently the demand from that section for plants has been far beyond the ability of the Department to supply. Owing to the limited facilities for propagation, the Department is unable to supply these plants in quantities for general planting. This, however, has never been contemplated; all that has been attempted is the introduction of good varieties, in small quantities, for wide distribution, for experiment in various localities where the preferred kinds will be propagated and increased as required. This is the policy pursued by the Department in the introduction, propagation, and dissemination of useful plants.

Figs.—Several years ago the Department imported a large collection of choice fig plants, from which many distributions have been made, with the result of increasing the culture of this fruit in many places where its culture was unknown or confined to a few inferior sorts. In the Southern States, where figs can be grown without artificial protection, their preparation for market by drying has not been a commercial success, but attention has been directed to canning the ripe fruit, and to marketing it in this condition, in the belief that a profitable industry may thus be inaugurated. About 6,000 cuttings and plants of figs, embracing 20 varieties, will be available as soon as the shoots mature.

Citrus trifoliata.—This is a hardy species of orange, introduced into this country by the Department many years ago, which is now in great demand for use as a stock upon which to graft the oranges of commerce. The older plants in the grounds annually produce fruits, from the seeds of which a large number of plants have been produced for distribution.

REPORT OF THE POMOLOGIST.

SIR: I have the honor to submit herewith a report of the work of this division for the fiscal year ending June 30, 1895, together with suggestions of proposed new work for 1896.

Respectfully,

S. B. HEIGES,
Chief.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE YEAR.

The work of the division during the past fiscal year consisted largely in the identification of specimens of fruit sent by growers, the examination, description, and valuation of new varieties sent by originators or introducers for that purpose, the disposal of the correspondence relating to the various phases of fruit culture, and the necessary current work resulting from describing, tabulating, and journalizing all specimens received during the year.

An accurate description, together with an outline drawing, is made of each new variety received. About 600 descriptions have been made during the year. Where marked differences are discovered in well known varieties, the result of differences in soil, climate or culture, careful descriptions are made, and in most cases models also, so that these variations of well established types may be preserved for future comparison. These are of great value in identifying and comparing varieties, and will eventually make possible the publication of an authoritative work on pomology. The modeler has added several hundred models to the collection prepared for the Columbian Exposition. The more promising varieties received are also preserved by means of water color illustrations for office use and future publication.

In addition to the collection of fig cuttings received through the courtesy of the Royal Horticultural Society of England, two sets of rooted cuttings, consisting of sixty-five varieties each, have been received from the same source. One of these was placed with the horticulturist of the Department of Agriculture and the other with an experienced propagator and experimenter in Mississippi. The varieties in these collections have made satisfactory growth, though owing to injury by the cold winter of 1894-95 it may be necessary to reimport a few varieties that have failed in order to maintain the complete collection. Plants will be propagated from this collection for distribution as rapidly as possible. It is believed that there is a sufficiently extended area within the United States naturally adapted to

the growth of the fig to supply the entire consumption in the United States of this delicious fruit. As the fig comes into fruitage at an early age these importations of authentically named varieties should soon enable us to decide upon the varieties best adapted to American conditions.

Scions of many of the choicest varieties of new fruits were placed with experimenters during the year for the purpose of determining their adaptability to various sections. They were placed under as diversified conditions of soil, climate, etc., as were deemed practicable.

In order to encourage the cultivation of improved chestnuts, scions of some of the largest and best varieties, together with a circular of instructions for grafting, were sent to many persons throughout the sections in which the native chestnuts grow. Most of these parties have reported good results from the grafting of the scions sent them.

Late in the spring of 1895 there were received from Sigmund Katona, of Kecskemet, Austria-Hungary, scions of 29 varieties said by the sender to be the choicest apples of that country. As these arrived too late for distribution, they were grafted by the division force upon upward of 2,000 seedling stocks and planted in the grounds of the Naval Museum of Hygiene in this city, where they are being properly cared for. The trees will be taken up during the approaching autumn, and will be distributed to the experiment stations of the various apple-producing States and to careful individual experimenters for testing. Considering the lateness of the season and the advanced stage of the scions when received, a good percentage of the grafts have taken and a satisfactory growth has been secured.

The opportunity afforded by the propagation of the Hungarian varieties of apple by root grafting, was improved by starting a comparative test of three methods of nursery propagation, concerning which there has recently been much discussion among nurserymen and fruit growers. Scions of 25 varieties of these apples were propagated upon "whole roots," "top cuts," and "bottom cuts" in nearly equal members. These grafts are being grown side by side under identical conditions, and their differences in growth and vigor in the nursery will be carefully recorded. When distributed to experimenters in different climates an endeavor will be made to have them kept under observation for a series of years in order that the comparative merits of these chief modes of root grafting may be in some degree determined.

Having learned of a class of persimmons in northern China said to be more hardy than those imported from Japan, the Secretary of State was requested to obtain, through United States consuls in China, scions and seeds of the same. Owing to imperfect packing the scions were all dead upon their receipt here. The seeds were placed under the charge of the horticulturist of the Department for propagation and have produced upward of 400 trees which are making fine growth. These trees when sufficiently grown will be widely distributed for the purpose of testing their hardiness and value in other respects. They may prove valuable for crossing upon the native persimmon for the purpose of increasing the size and improving the quality. Too little attention has been paid to this valuable native fruit. Dried, after it has been thoroughly ripened by frost and freed from all astringency, it is almost equal to the date in quality.

The citron scions imported last year have made a satisfactory growth, and in a short time the Department will be prepared to furnish parties who desire to propagate this valuable citrus fruit with wood for that purpose.

The work of the special agent upon the revised catalogue of fruits was discontinued after the completion of the apple list, because of the exhaustion of the appropriation available for that purpose, but it is desired that this work shall be again taken up during the coming fiscal year.

PLANS FOR THE ENSUING YEAR.

It is proposed to continue during the coming fiscal year the general lines of work already described, with necessary enlargements, and the introduction of additional subjects of investigation, namely:

ENLARGEMENT OF THE VARIETAL HERBARIUM.

The collection of foliage, young and fruiting wood, together with blossoms, wherever possible, and their preservation in suitable cases, seems essential to the thorough identification of varieties so closely allied that identification without these elements, in many cases, scarcely rises higher than guesswork. The very penetralia of growth should be investigated in many varieties to make positive identification possible. In a few years an herbarium of immense value could be collected at very little expense, save the cost of the cases.

ILLUSTRATIONS OF TYPICAL FORMS OF GROWTH.

Another year's experience convinces me of the importance of this means of instruction through the medium of the annual report and other publications. Last year I reported: "So few of those who describe verbally the habits of growth have a knowledge of the pyramidal, the erect, the spreading, the dependent, the close, the open forms, that their descriptions are of little value in identifying varieties." Further experience emphasizes and corroborates the statement.

INVESTIGATION OF METHODS OF PROPAGATION.

Owing to our ignorance of the adaptability of the varieties of apples imported from Austria-Hungary to our varying conditions of soil, climate, elevation, etc., the experiment upon the different forms of root-grafting may not be decisive—a crucial one.

I therefore respectfully suggest that the experiment may be continued upon a less restricted basis. A series of experiments should be planned and directed by the Pomologist, the tests to be made in several different soils, latitudes, and climates. The trees should be propagated at one place under his supervision, on seedling stocks of uniform size and vigor, by "whole root," "top-cut," and "lower-cut" grafting and by budding. These trees should be distributed at the proper time to a number of planters, either horticulturists of experiment stations or reliable private individuals in localities possessing the striking characteristics of our most important fruit-growing regions, to wit: Maine or Massachusetts, New York or Pennsylvania, Virginia or North Carolina, Michigan, Ohio or Indiana, Kansas or Missouri, Iowa or Nebraska, Minnesota or Wisconsin, Texas, Colorado, California or Oregon. Varieties of varying habits of growth and longevity should be chosen, for instance, Winesap, Ben Davis, Oldenburg, Northern Spy, Whitney No. 20. Two trees of each of the above varieties, propagated by the four different methods, could be sent to each selected station, and at regular intervals for a term of years descriptive photographic records

of the development of the trees could be made. We consider this the only way to properly settle this question, the settlement of which would be worth countless thousands of dollars to the apple growers of this country.

JORDAN ALMOND.

I would suggest that authority be given the Pomologist to investigate the sources of supply of the Jordan almond, and to import budded trees of this variety.

COOPERATION WITH STATE EXPERIMENT STATIONS.

There is reason to believe that there are valuable varieties of fruits in many of the States that have not been brought to the attention of this division, and that have not been described by any of our authorities on pomology. As the horticulturists of the State experiment stations have special facilities for securing such fruits, though in many cases they are without the appliances and trained assistance necessary to correctly record, describe and preserve them by means of accurate descriptions, illustrations and models, it seems probable that some plan of cooperation might be developed which would result in a distinct advance in the practical work of both the experiment stations and this division. If it were deemed practicable, these stations might be furnished with a model of any variety of superior excellence that shall be brought to the knowledge of the Department through the exertions of each. By this means many valuable fruits might be discovered, and the several stations and this division be brought into closer relations, profitable alike to all.

REPORT OF THE SPECIAL AGENT AND ENGINEER FOR ROAD INQUIRY.

SIR: I have the honor to submit herewith a review of the operations of this office for the fiscal year ending June 30, 1895.

Respectfully,

ROY STONE,
Special Agent and Engineer.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE OFFICE.

Since I last had the honor to report to you upon the operations of the Office of Road Inquiry the work of the office has progressed steadily upon the conservative lines laid down by you in the order for the organization of the inquiry, and while its action has not been officious or intrusive, there are many evidences of its increased usefulness, and its service to many official and other organizations engaged in promoting the improvement of highways throughout the country has been gratefully acknowledged.

ROAD WORK IN CALIFORNIA.

The suggestion made, with your sanction, to the governors of various States that the subject be committed to a legislative and expert board, which might cooperate with this office in securing the information necessary to effective legislation, was well received and acted upon by many of the governors. In California the retiring executive, Governor Markham, urged the matter upon the attention of the legislature, and a commission was promptly named consisting of two members of each house and two experts.

By request of the governor and of the State Road Improvement Association, I attended the meetings of this commission and also of the State Road Convention, and after consultation with the present executive, Governor Budd, a complete system of State aid and supervision was devised and very speedily adopted by the legislature. That system has now gone into effect and will undoubtedly result in very great benefit to the State. It consists mainly in the establishment of State supervision, through a board of highway commissioners, over all the road construction and repair in the State, and in the founding of a very extensive plant for the preparation of road materials, by means of prison labor and the valuable water power owned by the State. This plant will be able to quarry and crush about 1,000 cubic yards of stone per day. It was necessary, however, to secure very great reductions in

rates of railroad transportation before this material could be made of any service to the State. I was fortunately able to be of assistance in this direction, and rates were secured from the Southern Pacific Railway Company covering only the actual cost of hauling. The result will be that road materials will be delivered to the various counties in the interior valleys of the State at a cost of 22 cents per yard for the material and from 25 to 75 cents per yard for railroad transportation, instead of a total cost of \$4 to \$5 per yard, as heretofore.

The ordinary expenditure for roads in California has been about \$4,000,000 per annum for some years, and it will probably not be necessary to increase this total expenditure except as it may be voluntarily done by counties and districts. By economizing and a proper administration of the funds used a very large portion of this sum can be diverted to the permanent construction of stone roads or to the payment of interest on money borrowed for this purpose.

ACTION OF OTHER STATES.

In the State of New York, Governor Morton in his first message advised the appointment of a commission to put itself into communication with the national and State authorities on this subject. Such a commission was appointed by the assembly, with authority to sit during the recess, to travel through New York and other States, and to report to the following legislature. That commission has been very industriously at work, and I have met with them on several occasions in New York State and elsewhere. They will undoubtedly make such a report as will enable the coming legislature to profit by the experience of other States and by the best information obtainable.

The States of Connecticut and Rhode Island have appointed permanent State highway commissions and are proceeding under systems of State aid modeled upon the system which has been so effective in New Jersey. Many other States have modified their road laws since the date of my last report in the direction either of a better administration of the old systems or the adoption of new ones.

Many of the Southern States are making effective use of convict labor under county control in work upon the highways, but the tendency in the country at large is toward the California system of employing convicts in the preparation of road materials rather than in the construction of roads, keeping them in camps and quarries, where they can be guarded and secluded as cheaply as in prisons, and with an advantage to their health and general well-being. Under this system they do not enter into competition with mechanical labor, nor, to any objectionable extent, with ordinary labor.

GROWTH OF FEELING IN FAVOR OF STATE AID.

The growth of feeling in favor of State aid to road construction is very marked in every direction. The recent convention at Richmond, Va., which was largely attended by representative men, prepared and unanimously adopted such a scheme of legislation after a thorough discussion of the subject. The lower house of the New York legislature passed a liberal State aid bill in 1894, after a visit made by many of the members of that house to the New Jersey State aid roads.

Upon a thorough investigation of the subject, I am satisfied that moderate aid, contributed by means of a State tax, to localities which will voluntarily contribute to the improvement of their own highways,

will accomplish much not only in actual road construction but in the general development of a sentiment in favor of good roads. It is practically a premium upon local energy and public spirit. It scatters object lessons in road improvement and engenders a competition for the benefit of State aid which becomes a rapid educator everywhere. It has the merit that it offers a local initiative and does not require the education of a whole county, but offers itself to the immediate relief of the more liberal and enlightened neighborhoods within the county. It recognizes moreover that the true unit for road improvement in agricultural regions is the neighborhood or district immediately benefited by the improvement of a particular section of road.

In most cases the benefit district of any section of road can be as accurately defined as the drainage district of a stream. Its inhabitants are an absolute unit in interest; their exact shares in the benefit will be proportional to their use of the road and can be readily determined—they can act, therefore, in entire harmony, free from the local jealousies which hamper the actions of townships and counties. Just what should be the share of those so benefited, in the entire cost of the road, is a matter open to much discussion. We must consider that the same taxpayers must ultimately, through their county and State taxes, help to pay for all the roads in the State, and if this plan is to be relied upon to produce object lessons for the whole State it must not be so handicapped as to prevent its prompt acceptance by many localities.

The benefit districts include, of course, much more territory than the abutting farms, which in New Jersey pay one-tenth of the cost of the road. The New York State law contemplates the payment of 33 $\frac{1}{3}$ per cent by the entire benefit district where such district is not restricted by natural obstacles or artificial conditions. This payment, however, is designed to be spread over a period of ten years, and if the benefit district averages 1 mile on each side of the road, or 1,280 acres to each mile of road, it is estimated that the local taxation during the ten years need not exceed the present average taxation for road repairs.

COST OF HAULING FARM PRODUCTS.

Through the valuable cooperation of the Division of Statistics of this Department this office has been able to gather from 1,160 counties in the United States the average cost of hauling of farm products to market or to shipping points, with the results shown in the following table:

Groups of States.	Average length of haul.	Average weight of load for two horses.	Average cost per ton of 2,000 pounds per mile.	Average cost per ton for whole length of haul.
	<i>Miles.</i>	<i>Pounds.</i>		
United States.....	12.1	2,002	\$0.25	\$3.02
Eastern and Northern.....	6.4	2,177	.29	1.85
Cotton.....	12.6	1,397	.25	3.05
Southern Middle.....	8.8	1,869	.31	2.72
Prairie.....	8.8	2,409	.22	1.94
Pacific and Mountain.....	23.3	2,197	.22	5.12

These results show the immense expenditure and waste involved in the original transportation of farm products, but the actual loss due to bad roads can only be ascertained by comparison with the movement of the same products on good roads in other countries. To this end an investigation made by our consuls in Europe would be of greater value even than their former investigation regarding road construction.

COOPERATION WITH EXPERIMENT STATIONS.

The appropriation establishing this inquiry provides for "enabling the Secretary of Agriculture to assist the agricultural colleges and experiment stations in disseminating information on this subject" (road making). No practicable method has heretofore been discovered for carrying out this provision, but upon consultation with the Director of Experiment Stations I am disposed to recommend the object-lesson method of disseminating such information by means of roads constructed for actual use on or adjacent to farms of experiment stations, such roads to be laid out and constructed under the supervision of this office. This would accomplish a treble purpose—first, in the economic administration of these farms; second, in the instruction of those concerned in road making; and third, in presenting the advantages of good roads to the visiting public.

PUBLICATIONS.

Since the last report there have been published—

Bulletin No. 10. Proceedings of National Road Conference at Asbury Park, N. J., July 5, 6, 1894.

Bulletin No. 11. Proceedings of Virginia Road Convention, 1894.

Bulletin No. 12. Wide Tires.

Bulletin No. 13. Kentucky Highways. By Maj. M. H. Crump.

Bulletin No. 14. Governors' Messages.

Bulletin No. 15. Proceedings of Texas Road Convention.

Bulletin No. 16. Convict Labor on Highways.

Bulletin No. 17. Historical and Technical Papers on Road Construction.

Bulletin No. 18. State Laws Relating to the Management of Roads.

Circular No. 14. Addresses by Roy Stone.

Circular No. 15. A Bill for State Aid in New York.

Circular No. 16. Highway Taxation—Comparative Results of Labor and Money Systems.

Circular No. 17. Origin and Work of the Darlington Road League.

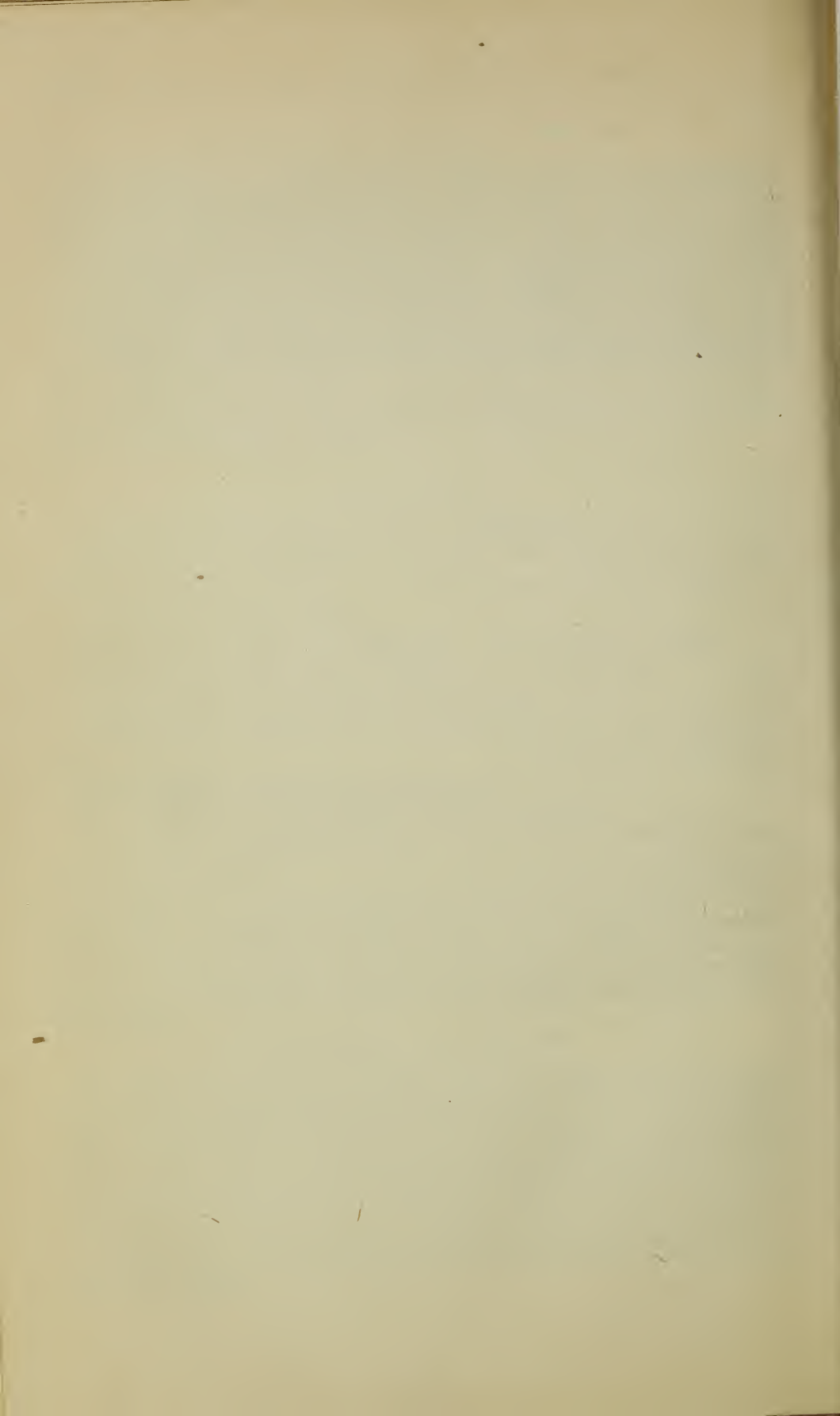
In addition to this list, Bulletin No. 19 will give an account of the construction of experimental roads in and near the exposition grounds at Atlanta, Ga., together with the traction tests of various vehicles on roads of different grades and surface; and Circular No. 18 will contain the scheme of legislation adopted by the Virginia State Good Roads Convention.

GOOD ROADS NATIONAL MAP.

The office is compiling a national map, on a large scale, of all the macadamized and graveled roads in the country. Upon this map new roads will be laid down as they are built, to show the current progress of road improvement. In order to get the necessary information for this purpose, a map of each county is sent to the county clerk or surveyor, to be returned with the roads laid down upon it. No general map of this kind has ever been compiled, and it is believed that it will be of great value when finished. The maps of Pennsylvania, Indiana, and New Jersey are completed, and those of other States are in various stages of progress.

SAMPLES OF ROAD MATERIALS.

A beginning has been made in the collection of specimen road materials from all parts of the United States, and enough has been done to show that a very interesting and valuable collection can be made with slight expense. It will be very desirable in future to arrange some scheme of cooperation with the United States Geological Survey for promoting this collection and for the gathering of general information regarding the location of the best road materials. The present office affords no room or convenience for displaying the collection already made, and some provision for that purpose will be necessary.



REPORT OF THE CHIEF OF THE SEED DIVISION.

SIR: In compliance with your order of July 25, 1895, I have the honor to submit herewith a detailed statement of the operations of the Seed Division from July 1, 1894, to October 1, 1895.

Very respectfully,

M. E. FAGAN,
Chief.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE YEAR.

Nearly 10,000,000 papers of seed were prepared for distribution during the year, of which 9,528,653 were distributed up to and including June 30, 1895, leaving a balance on hand of 372,500 papers, which have since been distributed, as shown by the supplemental statement from July 1 to October 1, 1895.

The total cost of the seeds, bulbs, scions, etc., including freight and drayage charges, was \$50,590.24; labor of putting the same in pockets cost \$28,966.33. If to the foregoing be added the salary and expenses of the seed-purchasing agent, the expenditures for paper, seed bags, materials for making paste, etc., a total of \$88,563.86 is obtained, which represents the entire expenditure under the seed appropriation, leaving unexpended a balance of \$40,200.34.

The average cost per paper amounted to about 1 cent, exclusive of the cost of carriage through the mails. This shows a difference in cost under the previous year of nearly one-half cent per paper.

The weight of matter transported and delivered by the United States Post-Office Department free of charge amounted to 270 tons, including weight of mail bags and wrappings.

The expenditures in detail are shown in the accompanying table, to which are added statements of the number and kind of seeds, etc.

Summary of expenditures, Seed Division, 1894-95.

Garden and field seeds.....	\$45,107.03	
Flower seeds.....	2,602.57	
Bulbs.....	1,058.85	
Scions, etc.....	19.00	
Freight charges and drayage.....	1,802.79	
Salary of purchasing agent.....	2,000.00	
Expenses of purchasing agent.....	243.30	
Salary of Richmond Stone.....	180.00	
		\$53,013.54
Labor, at \$40 per month.....	20,226.43	
Labor, at \$50 per month and over.....	8,739.90	
		28,966.33
Materials for making paste.....		217.36
Paper.....		568.84
Paper seed bags.....		5,521.98
Sundries.....		275.81
Seed, materials, and labor in seed room.....		88,563.86
Salaries of statutory employees.....		12,896.00
Sum set apart for seed fund.....	\$125,000.00	
Sum set apart for gardens and grounds.....	5,000.00	
		130,000.00
Sum expended from seed fund.....	88,563.86	
Sum expended from fund for gardens and grounds.....	1,235.80	
		89,799.66
Balance unexpended.....		40,200.34

Tabulated statement showing the kinds and quantities of seed issued from the Seed Division, under the general appropriation act of Congress, from July 1, 1894, to June 30, 1895.

Description of seeds.	Num- ber of varie- ties.	Senators, Represent- atives, and Delegates in Con- gress.	County sta- tistical cor- respond- ents.	State statis- tical agents.	Expermnt stations and experi- mental farmers.	Agricul- tural associ- ations and miscellane- ous appli- cants.	Total.
		<i>Packets.</i>	<i>Packets.</i>	<i>Packets.</i>	<i>Packets.</i>	<i>Packets.</i>	<i>Packets.</i>
Vegetable.....	162	6,473,058	203,946	52,415	16,830	1,844,915	8,591,164
Flower.....	73	614,407	93,450	25,965	10	37,948	771,780
Tobacco.....	12	70,015	128	17	2,032	1,810	74,002
Sunflower.....	1		7			194	201
Wheat.....	1		1	3		306	310
Corn.....	7	13,064	2,402	584	822	15,975	32,847
Oats.....	1		2	3		539	544
Barley.....	1		3	1		136	140
Lentils.....	1				71	29	100
Grass.....	7	10,853	66	57	762	2,395	14,076
Clover.....	2	9,918	23	12	70	497	10,520
Millet.....	1		329	3	186	287	805
Kaffir corn.....	2		10	2	270	533	815
Jerusalem corn.....	1		6	1	284	1,085	1,376
Millo maize.....	1		1		240	63	304
Soja beans.....	2		2		395	97	494
Flat peas.....	1				219	134	353
Serradilla.....	1				217	41	258
Spurry.....	1		1			14	15
Teosinte.....	1		3		85	69	157
Hairy vetch.....	1		8		106	140	254
Rape.....	1		2,332	1,105		213	3,650
Sugar beet.....	2				10	2,733	2,743
Mangel-wurzel.....	1		2,335	558		100	2,993
Cotton.....	4	17,771	895	8	12	66	18,752
Total.....		7,209,089	305,950	80,734	22,561	1,910,319	9,528,653

Tabulated statement showing, by States and Territories, the number of packets of seed issued from the Seed Division, under the general appropriation act of Congress, from July 1, 1894, to June 30, 1895.

States and Territories.	Senators, Representatives, and Delegates in Con- gress.	County sta- tistical cor- respond- ents.	State sta- tistical agents.	Experiment stations and experi- mental farmers.	Agricul- tural associ- ations and miscellane- ous appli- cants.	Total.
	<i>Packets.</i>	<i>Packets.</i>	<i>Packets.</i>	<i>Packets.</i>	<i>Packets.</i>	<i>Packets.</i>
Alabama.....	230, 476	7, 988	4, 248	2, 546	1, 978	247, 236
Alaska.....					37	37
Arizona.....	16, 145	246	445	980	216	18, 032
Arkansas.....	134, 991	8, 682	1, 320	530	7, 236	152, 759
California.....	140, 025	5, 696	881	273	2, 547	149, 422
Colorado.....	77, 903	5, 097	2, 021	292	23, 039	108, 352
Connecticut.....	97, 853	952	317	145	677	99, 944
Delaware.....	49, 621	336	130		96	50, 183
District of Columbia.....					21, 312	21, 312
Florida.....	68, 599	4, 764	1, 416	460	3, 251	78, 490
Georgia.....	261, 687	16, 821	3, 587		16, 841	298, 936
Idaho.....	51, 169	1, 692	535	464	449	54, 309
Illinois.....	372, 147	11, 753	2, 907	3	4, 420	391, 230
Indiana.....	207, 370	11, 438	1, 855		2, 251	222, 914
Indian Territory.....		463			10, 330	10, 793
Iowa.....	203, 219	11, 606	3, 639		3, 217	221, 681
Kansas.....	197, 658	12, 060	3, 244		304, 010	516, 972
Kentucky.....	208, 388	13, 985	2, 683		20, 168	245, 224
Louisiana.....	124, 111	6, 364	1, 953	1, 010	869	134, 307
Maine.....	95, 203	2, 215	414		1, 396	99, 228
Maryland.....	121, 426	2, 826	450	752	3, 519	128, 973
Massachusetts.....	170, 695	1, 522	755	174	11, 854	185, 000
Michigan.....	185, 450	8, 797	3, 973	729	2, 450	201, 399
Minnesota.....	133, 148	8, 491	2, 718	706	16, 593	161, 656
Mississippi.....	195, 385	9, 050	1, 789	557	998	207, 779
Missouri.....	245, 846	13, 355	1, 818	386	5, 637	267, 042
Montana.....	49, 233	1, 990	910	1, 021	249	53, 403
Nebraska.....	221, 961	10, 201	6, 131	220	895, 241	1, 133, 754
Nevada.....	33, 004	615		875	88	34, 582
New Hampshire.....	63, 021	1, 187	197	386	406	65, 197
New Jersey.....	152, 341	2, 908	578		4, 172	159, 999
New Mexico.....	16, 768	978	10	430	400	18, 595
New York.....	474, 842	7, 223	1, 828	168	12, 715	496, 776
North Carolina.....	177, 341	12, 277	3, 313		7, 721	200, 652
North Dakota.....	36, 176	3, 719	4, 039	763	767	45, 454
Ohio.....	366, 723	10, 618	2, 877	142	18, 805	399, 165
Oklahoma.....	16, 513	1, 159	92		79, 990	97, 754
Oregon.....	65, 405	2, 842	570	230	1, 243	70, 290
Pennsylvania.....	488, 468	7, 881	1, 615	187	15, 752	513, 903
Rhode Island.....	58, 769	615	145	1, 305	291	61, 125
South Carolina.....	156, 712	4, 314	1, 240		3, 193	165, 459
South Dakota.....	71, 151	5, 907	1, 121	449	291, 288	369, 916
Tennessee.....	216, 823	10, 746	3, 251	608	86, 636	318, 069
Texas.....	247, 508	20, 816	3, 035	917	3, 822	276, 098
Utah.....	16, 482	1, 845	577	789	242	19, 935
Vermont.....	61, 964	1, 555	749	95	391	64, 754
Virginia.....	192, 594	12, 406	2, 111	125	16, 641	223, 877
Washington.....	71, 340	2, 865	490	755	1, 286	76, 736
West Virginia.....	100, 360	6, 750	1, 602	1, 138	1, 626	111, 476
Wisconsin.....	215, 501	7, 308	1, 055	636	1, 845	226, 345
Wyoming.....	49, 569	1, 026	100	1, 315	109	52, 119
Total.....	7, 209, 089	305, 950	80, 734	22, 561	1, 910, 319	9, 528, 653

Statement showing the kinds and numbers of packets of seed sent to foreign countries by the Seed Division from July 1, 1894, to June 30, 1895.

Countries.	Vegetable.	Flower.	Tobacco.	Corn.	Wheat.	Barley.	Jerusalem corn.	Grass.	Clover.	Rape.	Cotton.	Total packets.
Australia.....			20	4	-----	2	2	12	3	2	-----	45
Bermuda.....	10	-----										10
British Guiana.....	60	-----										60
Canada.....	10	10										20
China.....	25	50										75
Guatemala.....	33	-----										33
India.....	10	-----										10
Japan.....		20										20
Korea.....		10										10
Mexico.....	5	10		4	1			4			7	31
Newfoundland.....	10	-----										10
Nicaragua.....			15									15
Nova Scotia.....	26	15										41
Turkey.....	30	-----										30
Uruguay.....	50	-----										50
Zanzibar.....	30	20										50
Total.....	299	135	35	8	1	2	2	16	3	2	7	510

Allotment and distribution of seeds to Members of Congress for 1894-95, by States.

States and Territories.	Number of packets of seed allotted.	Number of packets of seed distributed.	States and Territories.	Number of packets of seed allotted.	Number of packets of seed distributed.
Alabama.....	178, 002	230, 476	Washington.....	65, 928	71, 340
Florida.....	65, 128	68, 599	Wyoming.....	49, 446	49, 569
Georgia.....	210, 666	261, 687	Idaho.....	49, 446	51, 169
Kentucky.....	214, 966	208, 388	Arizona.....	16, 482	16, 145
Mississippi.....	145, 638	195, 385	New Mexico.....	16, 482	16, 768
North Carolina.....	178, 702	177, 341	Oklahoma.....	16, 482	16, 513
South Carolina.....	146, 538	156, 712	Utah.....	16, 482	16, 482
Tennessee.....	195, 084	216, 828	Connecticut.....	85, 892	97, 853
Virginia.....	198, 884	192, 594	Delaware.....	49, 446	49, 621
West Virginia.....	99, 292	100, 360	Illinois.....	396, 368	372, 147
Arkansas.....	129, 856	131, 991	Indiana.....	247, 730	207, 370
California.....	148, 338	140, 025	Maine.....	98, 892	95, 203
Colorado.....	65, 928	77, 903	Maryland.....	132, 356	121, 426
Iowa.....	214, 266	203, 219	Massachusetts.....	247, 630	170, 695
Kansas.....	164, 520	197, 658	Michigan.....	230, 748	185, 450
Louisiana.....	129, 456	124, 111	New Hampshire.....	65, 928	63, 021
Minnesota.....	143, 338	133, 148	New Jersey.....	164, 820	152, 341
Missouri.....	278, 794	245, 846	New York.....	594, 052	474, 842
Montana.....	49, 440	49, 233	Ohio.....	380, 586	366, 723
Nebraska.....	131, 856	221, 961	Pennsylvania.....	528, 724	488, 468
Nevada.....	49, 446	33, 004	Rhode Island.....	65, 928	58, 769
North Dakota.....	49, 446	36, 176	Vermont.....	65, 928	61, 964
Oregon.....	65, 928	65, 405	Wisconsin.....	198, 584	215, 501
South Dakota.....	65, 928	71, 151			
Texas.....	242, 730	247, 508	Total.....	7, 351, 536	7, 209, 089

A supplemental statement showing the kind and quantities of seed issued from the Seed Division from July 1 to September 30, 1895, inclusive.

Description of seeds.	County statistical correspondents.	State statistical agents.	Miscellaneous applicants.	Total.
Vegetable.....	Packets. 132, 120	Packets. 59, 140	Packets. 180, 635	Packets. 371, 895

EXTRACTS FROM AGRICULTURAL REPORTS AND CONGRESSIONAL RECORDS.

In view of the recent determination to discontinue the distribution of seeds, none having been purchased by the Department for the ensuing year, it seems appropriate to present in this connection a brief historical review of the subject of seed distribution by the Department, comprising opinions of various Commissioners, Members of Congress, and reports of committees.

Efforts have been made at various times to confine the work of the Seed Division within statutory limits and remove it from Congressional influence, but these have met with but little success.

Four years after the organization of the Department of Agriculture the Commissioner called attention to the impropriety of the distribution of seeds and documents by Members of Congress, apparently overlooking the fact that the distribution of seeds by Members of Congress was not contemplated when the law was enacted, and that such distribution was without warrant, and that the power to correct the error was in his own hands.

The following extract from the Commissioner's report goes far to prove that seed distribution was regarded even at that day as an evil:

* * * Frequent complaints are made that the most valuable seeds and the annual reports of the Department sometimes find their way into inappreciative and even more, improper hands, while hundreds who desire and would utilize them are deprived of them. This evil (for any waste of the expense incurred by the Government in procuring seeds and preparing documents for distribution is truly an evil) may be unavoidable; it is certainly not remediable by this Department, but it is humbly submitted that if Congress would provide that a considerable portion now distributed to individuals by the Members should be divided among the State, county, and local agricultural societies, the evil would be greatly lessened. (Report of Commissioner of Agriculture, 1866, Isaac Newton, Commissioner.)

A circular issued by the Department in 1877, which embraced all the provisions of law bearing upon the subject up to that date, is here reproduced, showing the feeling of the Commissioner as to the propriety of the distribution:

DEPARTMENT OF AGRICULTURE,
Washington, D. C., July 30, 1877.

The following sections of the Revised Statutes of the United States embrace all the provisions of law in relation to the distribution of seeds by this Department:

"SEC. 520. There shall be at the seat of government a Department of Agriculture, the general design and duties of which shall be to acquire and to diffuse among the people of the United States useful information on subjects connected with agriculture, in the most general and comprehensive sense of that word, and to procure, propagate, and distribute among the people new and valuable seeds and plants.

"SEC. 526. The Commissioner of Agriculture shall procure and preserve all information concerning agriculture which he can obtain by means of books and correspondence, and by practical and scientific experiments, accurate records of which experiments shall be kept in his office, by the collection of statistics, and by any other appropriate means within his power; he shall collect new and valuable seeds and plants; shall test, by cultivation, the value of such of them as may require such tests; shall propagate such as may be worthy of propagation, and shall distribute them among agriculturists.

"SEC. 527. The purchase and distribution of seeds by the Department of Agriculture shall be confined to such seeds as are rare and uncommon to the country, or such as can be made more profitable by frequent changes from one part of our own country to another and the purchase or propagation and distribution of trees, plants, shrubs, vines, and cuttings shall be confined to such as are adapted to general cultivation, and to promote the general interests of horticulture and agriculture throughout the United States."

The Commissioner finds no authority in these provisions of law for the distribution of any other garden and field seeds than those which are "new and valuable." It is obvious that the decision as to what is new and valuable must depend mainly upon

considerations of soil and climate. What may be well known and comparatively worthless in one section of the country may be new and valuable in another. What is absolutely new and untried will of course require the test of experience to prove its value and ascertain its adaptability to any given section. It is plain, also, that the law does not contemplate the purchase and dissemination of such seed as may readily be procured at the many seed establishments of the country.

It will be the aim of the Department, in this view of its duties, to distribute as widely as possible such new and valuable and improved varieties of seeds as may be adapted to general cultivation, or to different sections of the country, so as to meet the various demands of our widespread population, and conduce to the interests of agriculture throughout the country. This distribution will be made through agricultural organizations and such individuals as may desire to enter upon a series of experiments, and who may seem to afford the best security for thorough, careful, and exhaustive trials of seeds in different parts of the country, and under varied circumstances of soil and climate. As the desired results of such a distribution can only be attained by repeated and careful experiments, the Department will expect, as a condition of distribution, assurance of such trial as will afford a satisfactory test. Blanks for making these returns will be sent with the seed, and when returned, carefully filled up, will entitle the person favored by the Department to future consideration.

WM. G. LEDUC,
Commissioner of Agriculture.

In his report of the same year, Mr. LeDuc gives a tabular statement of the seeds distributed, and in connection therewith made the following statement:

This distribution, as will be seen, extends through the fiscal year ending June, 1877, and includes, therefore, the fall planting of last year and the spring planting of the present year. While this distribution is believed to have been in many respects of great value to the country, it was found to possess some features that were not wholly legitimate. I have accordingly introduced some changes in the method of distribution which will conform to the organic law and result in a more beneficial working of the system.

It will be seen from the above table that the distribution embraced very many common vegetable and flower seeds, and finding no authority in the provisions of the organic law of the Department for the distribution of these, or, indeed, any other description of seeds than those which were "new and valuable," I deemed it my duty to limit the distribution to such seeds as were clearly within the meaning of the law, having due regard to differences of climate and other agricultural conditions of the various sections of the country.

It will be observed, also, that a large portion of the seeds was issued to "miscellaneous" applicants, necessarily with little or no knowledge on the part of the Department as to the claims of such applicants as agriculturists. This, it was believed, led to misapplication, abuse, and even fraud, in the use of seeds, and a more careful scrutiny has, in consequence, been exercised by confining the distribution to agricultural associations and colleges, permanent correspondents, and agents of the Department defined by the law, which designates such persons, and such only, as the recipients of the bounty of the Department.

In his report to Congress the following year (1878) Mr. LeDuc gives the results of his observations of the evils of Congressional interference with the work of the Department, as follows:

DISTRIBUTION OF SEEDS.

The organic law establishing the Department, and which has not been changed or modified in this respect, makes it the duty of the Commissioner to confine (section 526) "purchase and distribution of seeds by the Department of Agriculture to such as are rare and uncommon to the country, or such as can be made more profitable by frequent changes from one part of our country to another," etc.

By these express terms it becomes as much the duty of the Commissioner to distribute as to purchase these seeds. Both purchase and distribution are devolved on him alone. But, for reasons not now apparent, the distribution came in time to be transferred from the Department very largely into the hands of Members of Congress, a division of the seed being made in the rooms of the Department and sent to the Members at their several residences in Washington, during the sessions of Congress.

The result of this saving of trouble and shirking of responsibility by the Department of Agriculture was that Members of Congress were either overwhelmed with the burden of a personal distribution and a personal response to letters on the sub-

ject, at a time when legislative duties were most pressing, or had to be at the expense of a clerk for this purpose, or else were obliged to transmit the packages as received to postmasters and political friends in their respective districts, to be by them subdivided and further distributed—usually where they would do the greatest political rather than agricultural good.

As illustrating the manner in which I at one time hoped to correct this serious evil and the causes which have so far hindered its complete adoption and full effect, I beg leave to quote from a letter addressed, in February last, to certain Members of Congress, as follows:

“On assuming the duties of Commissioner of Agriculture I found that the distribution of seeds as heretofore conducted had grown outside of the law to an evil of serious magnitude; that, in contravention of the manifest purposes for which the Department was created, it had included not more of ‘new and valuable’ seeds than of the commonest kinds already in use, and which could be bought in almost every seed store, not to say country grocery; that it had been extended so as to embrace almost every manner of applicant, not less the country merchant whose object was to sell at retail than the bona fide cultivator of the soil; that it was prejudicial to agriculturists themselves, lulling them into an indifference about raising their own seeds—the only safe and judicious plan, and last, but not least, that it was (and was so pronounced by many of their number) a great, unnecessary, and unwarranted tax on the time, attention, and patience of Members of Congress. To relieve them of this onerous burden, and to bring the action of the Department in the matter strictly within the intent and letter of the law, I determined to pursue the policy indicated in the circular issued July, 1877, and which I had the honor to submit to the consideration of Members of Congress.

“In this circular, issued, as will be seen, before the assembling of the present Congress, I requested its Members to designate the best men, in an agricultural sense, in their respective districts to receive ‘new and valuable’ seeds to be sent by the Department. Not only this, but at the request of many Members of Congress the Department undertook to reply to letters written to them, in which application had been or should be made for seeds, and to send the seeds to those applicants whom they would vouch for and nominate as intelligent and worthy agriculturists, and, furthermore, would answer the letters of those whose requests could not be granted, stating to the applicant the reason therefor, and citing the law on the subject.

“A majority of the Members have furnished lists, and the seeds have been sent in accordance therewith. Had I been able to adhere strictly to this course, much of the evil spoken of would, in my judgment, have been eliminated from the pre-existing practice. But it has now become apparent that the clerical force of the Department is inadequate to such a task, and I am therefore reluctantly compelled to remit, in many cases, to Members of Congress the burden of which they have complained, making it optional with them either to take the seeds to their rooms and themselves to be the distributors thereof or else to leave it with the Department to make the distribution among those to whom, under the plain construction of the law, it was intended they should be sent.

“Thus, for want of clerical aid, I am forced for the time to forego the line of action I had mapped out, and must of necessity content myself with the hope that it will gradually but surely become the undeviating practice, as it is and should be the undoubted policy of the Department; unless, indeed, some other and better course can be devised to moderate the demands of applicants and confine to legitimate bounds a distribution which has proved of so great value to the country, even in the imperfect manner in which it has heretofore been done.”

The views here expressed I have seen no reason to change in any essential particular. The necessity still exists, and must always exist, that this matter of distributing seeds shall be confined, equally with the duty of purchasing them, solely to this Department; and I am pleased to say that a large majority of the Members of Congress, whose opinions have been sought, signify not only their assent but their earnest desire to be relieved from this onerous tax on their time, by the relegation of the labor to the proper party.

They see, as the Department does, and as all impartial observers must, that an important purpose for which this Department was created, to wit, accurate experiments attending the introduction of new varieties of seeds, and intelligent reports on the same, leading to the elimination of the valuable from the valueless, can be reached in no other way than by having the Department to be the sole distributor of the seeds which are to be placed in the hands of the agriculturists, and the single depository of all the reports from the recipients of them—reports which are to be the basis of future distribution and guides to the agriculturists in every portion of the country. Already there are organized in the Department separate divisions charged with the work of gathering such reports from all parts of every State in the Union, eliminating from them all valuable information—information shaped by inquiries

pointedly directed—and filing the same in convenient form for future reference. Unless we can get such reports and have them convenient for reference, and thus know the results flowing from our distribution, the distribution of seeds at all is of doubtful value, and might as well be abandoned.

Only by obeying the organic law, which requires the Commissioner of Agriculture to distribute to agriculturists the seeds which invite them [to make a report], can we hope to obtain these reports with any degree of certainty. This law is mandatory and must be obeyed until Congress shall see fit to amend the same, and thus permit or prescribe some other method of distribution.

Of the thousands and thousands of dollars' worth of seeds that have passed through the hands of Members of Congress, it is safe to say that not a dozen reports have ever been made that have been available to the Department as data on which to determine the intrinsic value of the seeds which have been drawn from its supply, or of the causes leading to failure or to success, as the case may have been, in the various localities where they were tried.

This one fact furnishes all the argument necessary to give emphasis to the importance of a strict adherence to the law, which enjoins that the distribution be made by the Commissioner of Agriculture and only to agriculturists.

In his report for 1879 Mr. Le Duc gives the results of his withdrawal of seed from Congressional distribution, which seems to have been approved by all interested parties, as shown by the following extract from said report:

Resolutions of granges and other agricultural organizations, letters from all parts of the country, favorable comments of newspaper editors, and last, but not least, the hearty indorsement of very many Members of Congress, to whom seed distribution had become an onerous burden, leaving them little time to give to their duties as legislators, and proving an endless source of annoyance and loss of popularity, indorse the action of the Department in the matter of distribution of seeds according to the law, which directs the Commissioner of Agriculture to distribute seeds to agriculturists.

This work of the Commissioner of Agriculture, to confine the distribution of seed to the Department, resulted in the enactment of an additional clause in the appropriation bill of June 16, 1880, as follows:

An equal proportion of three-fourths of all seeds, plants, and cuttings shall, upon their request, be supplied to Senators, Representatives, and Delegates in Congress for distribution among their agricultural constituents, or shall by their direction be sent to their constituents, and the persons receiving such seeds shall inform the Department of the results of the experiments therewith.

During the debate upon this appropriation bill in the House of Representatives on May 18, 1880, Hon. D. W. Aiken, of South Carolina, made the following statement relative to the growth of the seed distribution and its results:

In 1839, \$1,000 was appropriated and placed in the hands of the Commissioner of Patents to be expended in collecting agricultural statistics. In 1851 this annual appropriation had grown to \$5,000. In 1862 the Agricultural Bureau was taken from the Patent Office and by statute enacted into a Department of Agriculture, receiving at the same time an appropriation of \$6,000 for its support during that fiscal year. From that day until the present time no annual appropriation for the Agricultural Department has ever reached \$200,000.

Until quite recently the bulk of each annual appropriation was expended in purchasing and distributing promiscuously immense quantities of seed, oftentimes inferior to those to be had from the most ordinary seed store. But, Mr. Chairman, let us not be too hasty in attaching culpability to the Department for this inefficiency. The law establishing the Agricultural Department required the Commissioner to *purchase rare and valuable seeds and distribute them among agriculturists*.

But no sooner did that law become effective than every Congressman became a genuine animated seed distributor, and, "bulldozing" the successive Commissioners into submission, without a vestige of right assumed the prerogative of scattering these seeds broadcast over the land. For twenty-five years this system prevailed, converting the Department into a wholesale seed store conducted on a cooperative principle, at once political and eleemosynary.

Thanks to the energy and persistence of the present Commissioner this abuse no longer exists, and seeds are now distributed with judgment and generally to parties whom they will benefit, and frequently to those who will improve the seeds.

Hon. James W. Covert, of New York, chairman of the Committee on Agriculture, in explaining the provisions of the bill made the following statement:

* * * The question as to the manner of seed distribution was discussed at length by the committee. We were aware of the fact that some objection has been urged to the present system and of a desire on the part of some of our associates on the floor to bring about a return to the former method of distribution; that is, that Senators and Representatives might themselves distribute the seeds among their constituents. Section 526 of the Revised Statutes, however, provides especially that the "Commissioner of Agriculture shall *distribute these seeds among agriculturists.*" I have quoted the exact wording of the statute. This reading will, I trust, satisfy the House, as it convinced the committee, that the present manner of distribution—by the Commissioner—is the only correct and legal method. * * * (Congressional Record, Forty-sixth Congress.)

Mr. Lefevre, from the Committee on Agriculture, submitted the following report:

* * * The Committee on Agriculture, to whom was referred the House resolution adopted on the 18th day of December, 1879, in terms as follows:

Resolved, That the Committee on Agriculture be authorized to take into consideration such measures as may tend to promote the agricultural interests of the country * * * and report by bill or otherwise such additional legislation as may be deemed necessary for the advancement of agricultural interests, etc. * * * The following recommendation was made: One of the chief aims of the Department is the distribution for experimental purposes of seeds and plants of value to the farmers of the country. In order that the value of these may be tested to some extent before they are sent out experimental gardens have been established and conducted upon the grounds of the Department, limited in extent and facilities.

Your committee would recommend an increase of the facilities for experiments in useful seeds and plants, and that the *distribution of such products should be held strictly within the limits of the provisions of the Revised Statutes.*

[Extract from Report of Commissioner of Agriculture, 1888.]

* * * The requirements of the organic law creating the Department of Agriculture are, "that it shall acquire and diffuse among the people of the United States useful information on subjects connected with agriculture, and procure, propagate, and distribute among the people new and valuable seeds and plants," and that the purchase and distribution of seed shall be confined to such seeds as are "rare and uncommon to the country," or "such as can be made more profitable by frequent changes from one part of our country to another." Undoubtedly the primary object of the seed distribution is to give increased value to production, to ascertain the best geographical distribution of varieties, and to more rapidly introduce these into localities to which they are best adapted. A gratifying degree of progress has been made in the efforts to comply with the spirit of this law. * * *

Nothing can be more injurious to the agricultural interests of the nation than the wide dissemination of imperfect seed, and that which is untrue to name, either by professional seedsmen or by the Agricultural Department.

The Department seeds are now mainly distributed through the following channels: First, to constituents of Members of Congress; second, to regular statistical correspondents; third, to experiment stations and agricultural societies; fourth, to experiment farmers; and fifth, to miscellaneous applicants. In all cases, so far as it is possible, such seeds are selected and sent out as are known to be suited to the respective localities. * * *

If the operations of the division are to be continued, then its most manifest and urgent need in order that its influence for the promotion of advanced agriculture may be enhanced and its fullest value realized, is that of suitable experiment grounds, where imported or contributed seeds, or presumably new varieties, can be tested, and their identity or their proper nomenclature established, so that it may be definitely ascertained whether they are worthy of further propagation and distribution.

Notwithstanding all the improvements that have been introduced, however, the Commissioner is of the opinion that the experiment stations of the various States could carry on the work of testing and distributing seeds with more advantage to the agriculturists of the country than can possibly be effected by the Seed Division of this Department. The director of each station knows, or should know, the wants of each State and Territory. He is familiar with its climate and soil and knows what products it is adapted to raise. He is better qualified to judge of the class of seeds needed in his section than anyone can be who is stationed at the capital of the

nation. Hence, I renew my recommendation of last year to so change the law as to transfer the distribution of seeds to the experiment stations of the various States and Territories.

EXPERIMENT STATIONS FOR TESTING AND DISTRIBUTING SEED.

* * * While I have endeavored to secure the greatest practical benefit to the farmers of the country under existing laws as they relate to the seed distribution by the Department, yet it is my opinion that the object aimed at could be better secured through the experiment stations that were provided for by law at the last session of Congress. It will be remembered that a bill was passed providing for an annual appropriation of \$15,000 for the benefit of the experiment station of each State and Territory in the United States. The object of these stations is to experiment with seeds, plants, crops, fertilizers, systems of culture, etc., and to determine what is best for their respective State or Territory. The directors of such stations ought to know which kinds of seeds the farmers of their State are most interested in, which are best adapted to each locality, what crops are most profitable to raise, and to direct their investigations and experiments and selection to such kinds as their constituencies are most interested in.

These stations are under the control of scientific and practical men, assisted by skilled laborers. Careful records are kept in every line of work, and the comparative merits of different varieties as to thriftiness, hardiness, productiveness, and general adaptation to the climate and soil are ascertained and published, and are considered authoritative. With a little additional aid to these stations, if not already sufficiently provided for, to purchase seeds and plants and test the same for their respective localities, and to distribute the seed from the same after ascertaining which are of real value to farmers, a most beneficial work for the farmers of every State could be accomplished. The stations could do the testing and experimental work for the whole body of agriculturists, and do it much better than farmers with but poor means for conducting such experiments. If this work of testing and distributing seed could be done by the stations and the Department be relieved of this duty, it would enable it to work in other directions of great importance to the agricultural interests of the country. It is hardly necessary to state that it takes much of the time of the Commissioner, and that it is difficult to make distribution to give satisfaction to all parties and to all parts of the country. While the germ of the Department of Agriculture was the seed distribution, it now reaches into many fields of science and many more lie beyond which as yet it has not had the time or means to enter. * * * (Agricultural Report, 1887, N. J. Colman, Commissioner.)

[Extract from Secretary Rusk's report, 1890.]

I have also continued and enlarged the distribution of seed to State experiment stations, these institutions having obviously the best facilities for giving the seeds a thorough trial and for making such reports regarding the same to the Department as will enable us to arrive at just conclusions as to the adaptability of the seeds to our climate and soil, as to the best methods of cultivation, etc., thus enabling us to accompany further distribution, if such be decided upon, with intelligent and reliable instructions.

From the foregoing it will be readily seen that the conditions under which seed should have been distributed were thoroughly understood by the various Commissioners and by Congress, but for some reason not now apparent the organic law was, with few exceptions, ignored. The only inference which can be drawn from the records now attainable is that the various Commissioners, with one exception (Mr. Le Duc), lacked the courage to oppose the demands made upon them by Members of Congress, fearing retaliation in the shortening of appropriations or in other ways.

It is clear from their reports that the law was understood by them and that they failed to execute it. It is also clear that they were not in favor of the promiscuous distribution of seed by the Department or through Congress, but favored the trial of seeds by experiment stations as the only method by which reliable reports as to adaptability could be secured.

For years the Congressional allotment of seed was made without warrant of law, and when the attention of Congress was directed to

this condition and the law enforced the clause before mentioned was made a part of each annual appropriation bill until the present time.

Another deviation from the law has been permitted for a number of years, viz, the transfer of seeds from one Member or Senator to another. The law distinctly states that the seeds are for "distribution among their constituents," but the account books prepared for this division have special lines printed therein for the record of transfers.

The system of transfers resulted in another abuse—the selling of the seed purchased by the Government for free distribution among the constituents of Senators and Members in what might be properly termed "open market," held in the halls and corridors of the Senate and House of Representatives, where seeds might be purchased from 1 cent per paper upward, according to the condition of the market. But this abuse is as much the fault of this Department as others spoken of, by reason of the fact that there is no law compelling the Department to recognize an order transferring seed from one Senator or Member to another, but it has been permitted to go on for so many years without question that it has practically grown into the system.

It would be unfair and untruthful to state that no good results have been accomplished by the distribution of seed by the Government, as many instances could be cited of great benefits resulting from the introduction of new and valuable varieties of wheat, oats, and corn, and possibly some few vegetable seeds, but the records of such benefits are very rare.

In view of all the recommendations made at various times it seems unaccountable why Congress has failed to remove the objectionable features of this legislative enactment or wipe it entirely from the statutes. The reasons for its continuance have long since ceased to exist, and its very close relationship to class legislation should further hasten its end.

The work of distributing new, rare, valuable, or other seed should be left entirely in the hands of the branch of industry to which it lawfully belongs, leaving the right of selection to the individual consumers, and to their individual efforts or the associated work of their class the determination of its value.

Further than this, the system as I view it is one which can reasonably exist only under a paternal form of government, as its object is clearly the extension of direct aid to one branch of industry, the expense of which is levied upon all other branches. Believing as I do that our Government was not intended to be a paternal or class government, and that its object was and is to secure to each and every citizen and to each and every lawful branch of industry full, fair, and equal consideration within the law, I consider the further expenditure of public money in the distribution of seed as unjust, uncalled for, and unnecessary.

REPORT OF THE SPECIAL AGENT FOR THE PURCHASE OF SEEDS.

SIR: I have the honor to submit herewith a report of the operations of this office during the period covering August 16, 1894, the date of my authorization, to June 30, 1895.

Respectfully,

ENOS S. HARNDEN,
Special Agent for the Purchase of Seeds.

Hon. J. STERLING MORTON,
Secretary.

The total amount expended during the year for seeds, bulbs, and cuttings was \$48,830.30, and for sundry expenses, \$425.30, aggregating \$49,255.60. This leaves a balance unexpended from the sum set aside for seed purchases amounting to \$744.40.

PERSONS FROM WHOM SEEDS WERE PURCHASED AND THE AMOUNT PAID THEREFOR.

The following statement shows the amount of seeds purchased, the name of the person or firm from whom they were received, and the cost of the same for the fiscal year ended June 30, 1895:

Cleveland Seed Company, Cape Vincent, N. Y.:

Corn, sweet—

Egyptian.....	bushels..	200
Hickox.....	do.....	200
Crosby's.....	do.....	31
Old Colony.....	do.....	50

Beans—

Southern Prolific.....	do.....	100
Detroit Wax.....	do.....	100
Pink Eye Wax.....	do.....	100
Flageolet Wax.....	do.....	50

Peas—

Alaska.....	do.....	200
Cleveland's Advancer.....	do.....	200
Carter's Premium Gem.....	do.....	200
Bishop's Long Pod.....	do.....	200
Laxton's Prolific.....	do.....	100
Laxton's Alpha.....	do.....	100
Day's Early Sunrise.....	do.....	100
Dwarf Champion.....	do.....	100
Tom Thumb.....	do.....	100
Sweet peas, mixed.....	pounds..	1,000

Cabbage—

Red Drumhead.....	do.....	500
Early Winningstadt.....	do.....	500
Extra Early Etampes.....	do.....	500
Charleston Jersey Wakefield.....	do.....	500
Short-Stem Drumhead.....	do.....	500

Cleveland Seed Company—Continued.

Cabbage—Continued.

Stein's Flat Dutch	pounds..	1, 000
World Beater	do	1, 000
All Seasons	do	1, 000
Brussels sprouts, imported	do	2, 000
Sunflower, large Russian	do	1, 000
Onion, Southport White Globe	do	375
Spinach, Mett's Crumpled Leaf	do	500
Muskmelon, Yellow-Fleshed Osage	do	100
Mustard, Mammoth California Yellow	do	150
Total cost		\$10, 449. 50

F. Barteldes & Co., Lawrence, Kans.:

Jerusalem corn	pounds..	2, 000
Red Kaffir corn	do	500
White Kaffir corn	do	500
Total cost		\$70

D. I. Bushnell & Co., St. Louis, Mo.:

Millo maize	pounds..	984
Kentucky blue grass	do	995
Corn, Extra Early Leaming	bushels..	66
Total cost		\$150. 47

J. M. Thorburn & Co., New York, N. Y.:

Beets—

Eclipse	pounds..	1, 000
Egyptian	do	1, 000
Rescue grass	do	300
Carrot, Parisian Button	do	60
Chrysanthemum, mixed	do	20
<i>Calandrinia grandiflora</i>	do	9½
Bachelor's Button	do	20
<i>Primula japonica</i> , mixed	do	5
<i>Ricinus gibsoni</i>	do	20
<i>Ricinus borbontensis</i>	do	20
Godetia, mixed	do	20
Zinnia, double, mixed	do	20
<i>Zinnia pompon</i>	do	20
<i>Centaurea cyanus</i> , mixed	do	20
<i>Dianthus hedderwigii chinensis</i> , double, mixed	do	10

Mignonettes—

Miles's Spiral	do	20
Golden Queen	do	20
Canary Bird Flower	do	20
Poppies, California (<i>Eschscholtzia californica</i>)	do	20
Acerolinum, choice, mixed	do	20
<i>Bartonia aurea</i>	do	20
<i>Callirhoe pedata</i>	do	15
<i>Nemophila maculata</i>	do	10
<i>Nemophila insignis</i>	do	10
<i>Nemophila alba</i>	do	10
Alyssum, finest Sweet	do	20
Antirrhinum	do	20
<i>Avena sterilis</i>	do	20
<i>Lobelia erinus</i> , mixed	do	20
<i>Nicotiana affinis</i>	do	20
<i>Gynierium argenteum</i>	do	20
Asters, Truffaut's Peony Flowered, mixed	do	5
<i>Verbena hybrida</i> , fine, mixed	do	15
<i>Ageratum mexicanum</i> , mixed	do	10
<i>Agrostemma</i>	do	10
<i>Dictamnus fraxinella</i>	do	10
Forget-me-not	do	20
Portulaca, fine, mixed	do	10
<i>Salpiglossis grandiflora</i>	do	10
Stocks, Evening Scented (<i>Matthiola bicornis</i>)	do	10
Sweet William, mixed	do	10
<i>Vinca rosea alba</i>	do	5

J. M. Thorburn & Co.—Continued.

<i>Vinca alba</i>	pounds..	5
<i>Phlox drummondii grandiflora</i>	do.....	10
Phlox, Star of Quedlinburg	do.....	10
Oenothera, mixed	do.....	10
Four o'clock	do.....	20
Clarkia	do.....	20
Total cost		\$1, 516. 87

Robt. Buist, jr., Philadelphia, Pa.:

Carrot, Parisian Button	pounds..	300
Total cost		\$150. 00

D. M. Ferry & Co., Detroit, Mich.:

Carrot—		
Red St. Valery	pounds..	137
Improved Luc	do.....	375
Watermelon, Sweetheart	do.....	100
Corn, sweet—		
White Cob Cory	bushels..	40
Red Cob Cory	do.....	160
Moore's Early Concord	do.....	200
Pease, Melting Sugar	do.....	50
Total cost		\$1, 048. 56

P. Henderson & Co., New York, N. Y.:

<i>Ammophila arundinacea</i> (Sea Sand Reed)	pounds..	100
Texas blue grass	do.....	25
Stocks, German, Ten Weeks	do.....	10
Marigold—		
Nugget of Gold	do.....	20
Eldorado	do.....	20
Cypress Vine, finest, mixed	do.....	20
Wisteria, Chinese blue	do.....	20
Candytuft—		
Dunnett's Dark Crimson	do.....	20
Mixed	do.....	20
Dianthus, <i>Hedderigii laciniatus</i> , double, mixed	do.....	10
Poppy, Shirley	do.....	20
Aquilegia, double, mixed	do.....	15
Total cost		\$475. 00

J. C. Vaughan, Chicago, Ill.:

Hyacinth bulbs		32, 000
Tulip bulbs		45, 000
Narcissus bulbs		15, 000
Crocus bulbs		30, 000
Total cost		\$1, 058. 85

D. Landreth & Sons, Philadelphia, Pa.:

Cucumber, Gherkin	pounds..	400
Carrot, Parisian Button	do.....	140
Corn, Pennsylvania Extra Early Dent	bushels..	100
Total cost		\$231. 00

H. Nungesser & Co., New York, N. Y.:

<i>Bromus inermis</i>	pounds..	500
Serradella	do.....	300
<i>Vicia villosa</i>	do.....	200
Tall oat grass	do.....	300
Yellow oat grass	do.....	200
<i>Lathyrus sylvestris</i>	do.....	200
Total cost		\$522. 25

Jerome B. Rice & Co., Cambridge, N. Y.:

Cabbage—		
Hollander	pounds..	1, 000
Luxemburg	do.....	1, 000
Total cost		\$1, 300. 00

J. E. Holland, Milford, Del.:

Crimson clover	bushels..	100
Total cost		\$375.00

Johnson, Robbins & Co., Wethersfield, Conn.:

Radish—		
Long Scarlet Short Top	pounds..	500
Early Scarlet Turnip	do	500
Parsnip, Hollow Crown	do	150
Total cost		\$167.63

W. A. Killingsworth, Cannonsburg, Miss.:

Cotton seed, Eclipse Long Staple	bushels..	60
Total cost		\$30.00

Ragland Seed Company, Hyco, Va.:

Tobacco—		
Brazilian	pounds..	30
Comstock Spanish	do	30
Vuelta Abajo	do	30
Partidos	do	30
Remedios	do	30
Renan-de	do	30
Deli-de	do	30
Little Orinoco	do	30
White Burley	do	30
Connecticut Seed Leaf	do	30
Hester	do	30
Ragland's Conqueror	do	30
Total cost		\$549.68

J. Planta & Co., Alexandria, Egypt:

Onion seed	bags..	1
Lentil seed	do	3
Total cost		\$49.43

L. F. Garrard, Columbus, Ga.:

Texas blue grass	pounds..	16
Total cost		\$24.00

Maury Ward, Joford, N. C.:

Cotton, Texas Oak	bushels..	150
Total cost		\$99.00

W. S. Hunter, Lewinsville, Va.:

Soja beans—		
Green	bushels..	13
Black	do	5
Total cost		\$72.00

Piasa King Farm Company, Godfrey, Ill.:

Corn—		
Eclipse	bushels..	100
Dungan's White Prolific	do	100
Piasa Queen	do	100
Piasa King	do	71½
Total cost		\$278.63

E. M. Rumph, Marshallville, Ga.:

Pearl millet	pounds..	2,000
Total cost		\$95.00

S. M. Tracy, Agricultural College, Miss.:

Corn, Mosby	bushels..	50
Total cost		\$50.00

H. Philipps Seed and Implement Company, Toledo, Ohio:

Oats, white Scotch superior	bushels..	50
Total cost		\$45.00

John R. Boyd, Madden, S. C.:		
Boyd's improved cotton seed.....	bushels..	70
Total cost.....		\$49.50
C. F. Carpenter, Bartow, Fla.:		
Teosinte.....	pounds..	200
Total cost.....		\$120.00
P. B. Walker, Warrenton, Ga.:		
Cotton seed, Big Boll Prolific.....	bushels..	150
Total cost.....		\$75.00
Daniel Good, Ewingsville, Pa.:		
Grafts chestnut wood.....		400
Total cost.....		\$2.00
P. Emerson, Wyoming, Del.:		
Ridgely chestnut wood.....	feet..	100
Total cost.....		\$5.00
H. M. Engle & Son, Marietta, Pa.:		
Paragon chestnut wood.....	feet..	100
Total cost.....		\$2.00
Wiley & Co., Cayuga, N. Y.:		
Apple seedlings.....		2,000
Total cost.....		\$7.00
Northrup, Braslan, Goodwin Company, Chicago, Ill.:		
Asparagus, Columbian Mammoth.....	pounds..	200
Beans—		
Lazy Wife (pole).....	bushels..	30
Curry's Rust-Proof Wax.....	do....	150
Wardwell's Kidney Wax.....	do....	150
Low's Champion.....	do....	100
Broad Windsor.....	do....	100
Scarlet Runner.....	do....	100
Burpee's Lima.....	do....	100
California Tree.....	do....	150
Kentucky Wonder.....	do....	50
Round Yellow Six Weeks.....	do....	50
Golden Eye Wax.....	do....	100
Improved Yellow Eye.....	do....	100
Detroit Wax.....	do....	100
Early Red Valentine.....	do....	100
Long Yellow Six Weeks.....	do....	100
Peas—		
Sterling.....	do....	198
Horsford's Market Garden.....	do....	200
Dr. McLean.....	do....	100
Prince of Wales.....	do....	158
Dwarf Champion.....	do....	196
Alpha.....	do....	100
Corn—		
Moore's Early.....	do....	50
Late Mammoth.....	do....	200
Country Gentleman.....	do....	160
Crosby's Early.....	do....	160
Old Colony.....	do....	149
Early Mammoth.....	do....	200
Russell's Prolific.....	do....	50
Shaker's Early.....	do....	50
Beet—		
Crosby's Egyptian.....	pounds..	3,000
Swiss Chard.....	do....	3,000
Bastian's.....	do....	2,000
Lentz.....	do....	2,000
Dirigo.....	do....	3,000
Corn Salad.....	do....	150
Cress, Broad Leaf.....	do....	55
Cauliflower, Late Paris.....	do....	70

Northrup, Braslan, Goodwin Company—Continued.

Carrot—

Improved Luc	pounds..	125
Red St. Valery	do	363
Mastodon	do	500
Cabbage, Drumhead Savoy	do	500
Celery, Golden Self-blanching	do	50
Eggplant, New York Improved	do	100

Lettuce—

Golden Ball	do	1,000
Grand Rapids	do	1,000
Denver Market	do	1,000
Blonde Blockhead	do	1,000
Tilton's White Star	do	1,000
Tomhannock	do	1,000
Salamander	do	1,000
Chartier	do	1,000
Brown Dutch	do	989

Muskmelon—

Irondoquoit	do	400
Delmonico	do	400
Columbus	do	400
Banquet	do	400
Shumway's Giant	do	440
Surprise	do	400
White Japan	do	150

Watermelon—

Kentucky Wonder	do	300
Delaware	do	300
Hungarian Honey	do	183
Golden Honey	do	300
Fordhook	do	215
Prize Jumbo	do	300
Favorite	do	300
Cole's Early	do	300

Okra, White Velvet	do	50
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Onion—

Silver King	do	1,000
Early Red Globe	do	750
Barletta	do	750
Italian Wonder	do	750
Early Round White Dutch	do	750
White Portugal	do	750
Giant Rocco Yellow	do	500

Parsley, Beauty of Parterre	do	200
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Parsnip, Stump Rooted	do	600
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Pepper—

Sweet Spanish	do	50
Giant Emperor	do	50
Cranberry	do	50
Celestial	do	50

Pumpkin—

Nantucket	do	400
Sweet Potato	do	400
Japanese Pie	do	400
Calhoun	do	400
Winter Luxury	do	300
Jonathan	do	200

Cucumber—

White Wonder	do	400
Giant Pera	do	400
Snake	do	400
Siberian	do	500

Radish—

Early Long Scarlet Short Top	do	500
Early Scarlet Turnip	do	500
French Breakfast	do	1,000
Long Brightest Scarlet	do	1,000
Early Round Dark Red	do	1,000
Early White Turnip	do	1,000

Northrup, Braslan, Goodwin Company—Continued.

Radish—Continued.

Scarlet Turnip White Tipped	pounds..	1, 000
Early Yellow Summer Turnip.....	do....	1, 000
Early Olive Shaped Scarlet.....	do....	1, 000
Early Scarlet Globe.....	do....	1, 000
Chartier	do....	1, 000
Round Black Spanish.....	do....	1, 000
Long Black Spanish.....	do....	1, 000
Lady Finger.....	do....	1, 000
Rhubarb, Champagne.....	do....	100

Salsify—

Mammoth Sandwich Island.....	do....	100
Scorzoneria.....	do....	50

Spinach—

New Zealand.....	do....	500
Long Standing Prickly.....	do....	1, 000
Flanders Broad Leaf.....	do....	500

Squash—

Golden Custard.....	do....	300
Mammoth White Bush.....	do....	300
Mammoth Crookneck.....	do....	300
Bay State.....	do....	300
Sibley.....	do....	300
Fordhook	do....	342

Tomato—

Optimus.....	do....	400
Ignotum	do....	400
New Stone.....	do....	400
Tree.....	do....	400
Lorillard	do....	400
Mikado.....	do....	400
New Peach.....	do....	400

Asters—

Chrysanthemum Flowered, dwarf, white.....	do....	5
German Quilled.....	do....	5
Balsam Camellia, flowered.....	do....	5
Coreopsis lanceolata.....	do....	5
Canterbury Bell (Campanula).....	do....	5
Cosmos hybridus, mixed.....	do....	20
Daisy Snowball.....	do....	5
Digitalis, mixed.....	do....	10
Hollyhock, double, mixed.....	do....	10
Humulus Japonica, variegated.....	do....	10
Moonflower, fragrant.....	do....	4

Nasturtium—

Tom Thumb, mixed.....	do....	10
Tropæolum Lobbianum.....	do....	15
Portulaca, double, fine, mixed.....	do....	5
Phlox, hardy decussata, mixed.....	do....	5
Pansy, fine, mixed.....	do....	50
Portulaca, single, fine, mixed.....	do....	10
Salvia splendens.....	do....	5
Thunbergia, finest, mixed.....	do....	5
Total cost.....		\$29, 683. 95

Miscellaneous:

Vegetable seeds.....	papers..	14, 950
Flower seeds.....	do....	1, 350
Field corn.....	packages..	32
Grass seeds.....	do....	25
Clover.....	do....	25
Total cost.....		\$75. 00

Samuel C. Moon, Morrisville, Bucks County, Pa.:

Numbo chestnut wood.....	feet..	200
Total cost.....		\$3. 00

Grand total cost..... \$48, 830. 30



REPORT OF THE CHIEF OF THE DIVISION OF PUBLICATIONS.

SIR: I have the honor to submit herewith, in compliance with your order of July 22, 1895, a report on the work of this division for the year ending June 30, 1895, together with estimates and recommendations for the fiscal year ending June 30, 1897.

Respectfully,

GEO. WM. HILL,
Chief.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE YEAR.

PUBLICATIONS SUPERVISED.

During the fiscal year ending June 30, 1895, 254 publications (of which 120 were reprints) were handled in this division. These included not only publications chargeable to the general printing fund of the Department and the special divisional funds, all of them printed by the Public Printer on requisition from this office, but also publications issued as executive documents and printed by the Public Printer under authority of Congress. The following statement shows the precise number of each class:

Publications chargeable to regular fund.....	172
Publications chargeable to divisional funds.....	6
Publications printed at Weather Bureau.....	21
Publications issued as executive documents.....	4
Publications chargeable to Farmers' Bulletin funds.....	51
Total.....	254

The total number of printed pages comprised in the above publications, exclusive of reprints, is 14,831, and the total number of copies of all publications, as above, was 4,100,660.

The total number of requisitions drawn upon the Public Printer during the year and covering, in addition to the above publications, binding, printed blanks, etc., was 684. Each one of these represents a separate piece of work, of which a record is kept in this office from start to finish, and which almost invariably involves before undertaking and pending completion more or less discussion and consultation with the bureau or division requiring the same.

Aggregate printed matter distributed.—To those who are curious to know in detail how much reading matter this aggregates for distribution, it may be stated that a multiplication of the number of copies of each publication by the number of pages it contained gives an aggregate of printed pages amounting to nearly 420,000,000, each page averaging slightly more than 500 words, being more than six printed pages of matter issued from the Department of Agriculture for every man, woman, and child in the country, and distributed, almost without exception, free—a fact which unquestionably detracts very greatly from their value. Not only was this enormous mass of printed matter given practically free of cost to everyone who asked for it, but each publication was, moreover, mailed free of cost to the applicant wherever he might be. The liberality of the National Government in this respect may be better appreciated when it is known what a weight of matter is represented by our publications. The weight of the Annual Report alone (averaging nearly 40 ounces per volume) considerably exceeds 600 tons. As this publication aggregates 304,000,000 pages, and the remainder of our publications aggregate 116,000,000, it is obviously a reasonable estimate, even allowing for the difference between the board cover of the report and the paper covers of most of the other publications, to add at least one-third to the weight of the Annual Report in order to arrive at the total weight of publications, which would thus appear to be over 800 tons. These may seem trivial details, but it may be well for some people to study them and realize what is involved by an absolutely free distribution of all Government publications.

The total number of publications issued during the previous fiscal year was 205, including (exclusive of reprints) 10,512 printed pages and aggregating 3,169,310 copies. The great increase over these figures during the last fiscal year was due, principally, to the large increase in Farmers' Bulletins.

FARMERS' BULLETINS.

The appropriation bill for the fiscal year ending June 30, 1895 (p. 7), provides, under the head of "purchase and distribution of valuable seeds," that—

The Secretary of Agriculture may use not to exceed \$30,000 of the amount herein appropriated for the preparation, printing, and publishing of Farmers' Bulletins, which shall be adapted to the interests of the people of different sections of the country, an equal proportion of two-thirds of which shall be supplied to Senators, Representatives, and Delegates in Congress, for distribution among their constituents as seeds are distributed.

Under this appropriation 1,382,000 copies of Farmers' Bulletins were printed, while from the general printing fund there were printed 185,000 more, making a total of 1,567,000 copies of Farmers' Bulletins issued during the fiscal year. Of these there were distributed upon the request of Senators and Representatives 885,770 copies. As the act making appropriations for the last fiscal year was not approved until August 8, no printing of Farmers' Bulletins was done under the special appropriation therefor until after that date. The following is a list of the Farmers' Bulletins issued during the year, with the total number of each printed, and also the total number of each asked for by Senators and Representatives:

Farmers' Bulletins printed during the fiscal year ending June 30, 1895.

Name of bulletin.	Number printed.	Distributed to Congressmen.
<i>Published 1894-95.</i>		
No. 18.—Forage Plants for the South.....	75,000	22,547
No. 19.—Important Insecticides: Directions for their Preparation and Use.....	85,000	66,766
No. 20.—Washed Soils: How to Prevent and Reclaim Them.....	100,000	47,287
No. 21.—Barnyard Manure.....	180,000	115,896
No. 22.—The Feeding of Farm Animals.....	200,000	106,858
No. 23.—Foods: Nutritive Value and Cost.....	95,000	42,231
No. 24.—Hog Cholera and Swine Plague.....	170,000	95,266
No. 25.—Peanuts: Culture and Uses.....	28,000	4,123
No. 26.—Sweet Potatoes: Culture and Uses.....	53,000	9,279
No. 27.—Flax for Seed and Fiber.....	25,000	6,028
No. 28.—Weeds; and How to Kill Them.....	50,000	17,716
<i>Reprints.</i>		
No. 3.—The Culture of the Sugar Beet.....	37,000	26,200
No. 6.—Tobacco: Instructions for its Cultivation and Curing.....	53,000	23,860
No. 7.—Spraying Fruits for Insect Pests and Fungous Diseases, with a Special Consideration of the Subject in its Relation to the Public Health.....	20,000	28,763
No. 9.—Milk Fermentations and their Relations to Dairying.....	35,000	32,448
No. 11.—The Rape Plant: Its History, Culture, and Uses.....	16,000	8,719
No. 12.—Nostrums for Increasing the Yield of Butter.....	27,000	22,142
No. 14.—Fertilizers for Cotton.....	43,000	22,779
No. 15.—Some Destructive Potato Diseases: What They Are and How to Prevent Them.....	175,000	113,787
No. 16.—Leguminous Plants for Green Manuring and for Feeding.....	60,000	52,379
No. 17.—Peach Yellows and Peach Rosette.....	40,000	20,696
Total	1,567,000	885,770
	Copies.	Cost.
Printed and paid from Farmers' Bulletin fund.....	1,382,000	\$17,506.83
Printed and paid from general printing fund.....	185,000	3,609.10
Total	1,567,000	21,115.93

NOTE.—The "number printed" includes all printed during the fiscal year 1894-95 from both funds, regular and Farmers' Bulletin.

This shows that the average cost per copy was nearly 1 cent and 4 mills.

In pursuance of the provision of law authorizing such distribution, namely, that "the Secretary of Agriculture shall notify Senators and Representatives of the character and number of each bulletin and each other publication of the Department of Agriculture (not sent to the folding room of the Senate and House) to which each Senator and Member may be entitled for distribution on the basis herein provided for the distribution of bulletins," circulars in the form of descriptive catalogues have been addressed to Senators and Representatives from time to time, thus affording them an opportunity to apportion their orders to the wants of their constituents.

The above figures show conclusively the popularity of this class of publications.

As will readily be conceded after a perusal of the above list of titles, every effort has been made to observe the popular character designed for these bulletins.

Dangers to be avoided.—Under the watchful supervision of the Assistant Secretary the use of plain, simple language in these bulletins has been insisted on, with reasonable success and excellent results. At present the possible danger to be guarded against in this class of pub-

lications is the yielding to a popular clamor, which, encouraged in its efforts so far, to get something for nothing so long as the expense is defrayed from the National Treasury, will call for a Farmers' Bulletin on every subject upon which any number of individuals may desire to obtain information, regardless of its character. To yield to this tendency without due reference to the fact that in the fulfillment of its mission to diffuse information useful to farmers, the Department must always lead and not follow the lead of others, and to take up subjects upon which numerous publications already exist and upon which every farmer can obtain full information by paying for it, would incur the danger of letting an important branch of the Department work degenerate into a sort of cheap publishing house. So far, fortunately, it may be said that this danger has been avoided, and it may be added, without fear of contradiction, that in proportion to the amount expended no publications issued by the Government of the United States have been of more practical value to the public, both as to the number of persons reached and the character of matter distributed.

THE ANNUAL REPORT.

During this year a new departure was inaugurated with reference to the Annual Report, so as to comply with the provisions of section 73 of the act for public printing and binding approved January 12, 1895. In this section it is provided that—

The Annual Report of the Secretary of Agriculture shall hereafter be submitted and printed in two parts, as follows: Part one, which shall contain purely business and executive matter which it is necessary for the Secretary to submit to the President and Congress; part two, which shall contain such reports from the different bureaus and divisions, and such papers prepared by their special agents, accompanied by suitable illustrations, as shall, in the opinion of the Secretary, be specially suited to interest and instruct the farmers of the country, and to include a general report of the operations of the Department for their information. * * * And the title of each of the said parts shall be such as to show that such part is complete in itself.

In carrying out this law this division was ordered to report directly to the Assistant Secretary who had general charge of that portion of the work indicated as part 2, and which it was decided should be issued under the title of the Yearbook of the Department of Agriculture. Part 1 was completed during the past year, printed and issued in the form prescribed, making a volume of some 220 pages. The general plan agreed upon for the Yearbook embraced, first, a republication of the Secretary's personal report to the President, which was regarded as the most appropriate manner of complying with that provision of the law requiring part 2 "to include a general report of the operations of the Department;" second, reports from the different bureaus and divisions and papers prepared by special agents and designed especially for the use and information of farmers, every effort being made both in selection of subjects and in their handling to make this work of such a popular character as a distribution of half a million copies would seem to demand; third, an appendix consisting of a mass of useful information, statistical and otherwise, presented as far as possible in tables, reference to which is facilitated both in the arrangement and by headings and by a very full index.

With reference to the mechanical work of the volume, it was decided to limit it as to size to 600 pages, to exclude all colored plates, and as far as possible to substitute text figures for plate illustrations. The Yearbook for 1894 will therefore contain but 7 plates, while it will be

embellished with 140 text illustrations. The Public Printer, who has shown the utmost cordiality in cooperating with this Department in improving the character of this publication, agreed to devote the large saving thus effected to improvement in quality of paper, style of binding, etc., with the result that we may confidently anticipate a publication superior in all respects to any yet issued by the Department of Agriculture.

In the appendix to the present report, following the list of publications for the fiscal year, there is appended a table of the contents of the Yearbook for 1894, which will serve better than any description to convey a just idea of its general character. Preparations for the Yearbook for 1895 were undertaken before the close of the fiscal year, and with the experience of the past year before us, it is confidently expected that still further improvements will be evident in the Yearbook of the Department for 1895.

CHANGE OF NAME.

In the appropriation act of August 8, 1895, providing for the fiscal year ending June 30, 1896, this division was provided for under a new name, that of Division of Publications, which was preferred, as more simple as well as more exact, to that formerly borne, of "Records and Editing."

COST OF PRINTING AND BINDING.

The following table shows the total expense of printing and binding done by the Public Printer upon requisition of this Department, whether chargeable to the general printing fund or to the special divisional funds, and the amount chargeable to each bureau or division:

Statement of printing account—Expenditures by divisions.

Accounts		\$736.10
Agricultural Soils.....		774.90
Animal Industry.....	\$2,797.44	
Animal Industry (special).....	1,094.71	
		<hr/> 3,892.15
Botany	913.95	
Botany (special)	1,323.58	
		<hr/> 2,237.53
Chemistry	3,617.53	
Chemistry (special)	1,047.39	
		<hr/> 4,664.92
Entomology		3,572.76
Experiment Stations.....		19,453.77
Fiber Investigations		147.99
Folding room		34.50
Forestry.....		3,326.74
Gardens and Grounds		380.77
Library		2,505.44
Microscopy	\$181.96	
Microscopy (special)	196.90	
		<hr/> 378.86
Museum		19.48
Ornithology		2,187.76
Pomology.....		1,000.52
Records and Editing.....		565.46
Road Inquiry	\$2,355.95	
Road Inquiry (special).....	174.85	
		<hr/> 2,530.80

Seeds	\$161.84
Stationery and Property	82.55
Statistics	\$15,296.06
Statistics (special)	503.24
	<hr/>
Vegetable Pathology	15,799.30
Weather Bureau	1,424.42
Miscellaneous	4,052.25
Farmers' Bulletins	3,253.69
Farmers' Bulletins	17,506.83
Branch printing office bills, April 25 to June 29	2,806.17
	<hr/>
Total	92,997.50
	<hr/>
Charged to regular printing fund	71,149.00
Charged to Farmers' Bulletins	17,506.83
Charged to division funds	4,341.67

Total cost of printing for Department.—To arrive at the total cost of the printing done for the Department for free distribution, it would be necessary to add the cost of the printing office at the Weather Bureau, which is not yet available, and the cost of printing the publications issued as executive documents. This last information can only be obtained from the Public Printer. We do know, however, that the special appropriation for printing the half million copies of the Annual Report, distributed yearly, has for some years past amounted to \$300,000; that \$30,000 has similarly been appropriated for the report of the Bureau of Animal Industry, and for other special reports in proportion, and, judging by the cost of the printing office of the Weather Bureau in the past, the annual cost of printing the publications of this Department very largely exceeds \$400,000 on an average; some years indeed it has exceeded half a million. If the cost of distributing the documents be added, including the labor and clerical work in the Department and the cost of carrying the enormous weight of documents through the mails, this sum would undoubtedly be found to average over \$600,000, for, taking the cost of transmission to be the postage charge on book matter, this charge alone on the more than 800 tons of matter published for distribution would amount to about \$130,000, while the cost of handling, including both labor and clerical work, would bring up the cost of distribution to \$160,000 or \$170,000—this sum to be added to the cost of printing.

BRANCH PRINTING OFFICE.

Under the act providing for the public printing and binding and the distribution of public documents, approved January 12, 1895, the printing office for this Department—provided for in the seed appropriation and in which the printing of the seed pockets was done, as well as a considerable amount of job printing in the form of circulars, blanks, envelopes, etc.,—was transferred to the control of the Public Printer. (See section 31 of the act referred to.) It was further provided that—

All work done in the said offices shall be ordered on blanks prepared for that purpose by the Public Printer, which shall be numbered consecutively, and must be signed by some one designated by the head of the Department for which the work is to be done, who shall be held responsible for all work thus ordered, and who shall quarterly report to the head of the Department a classified statement of the work done and the cost thereof, which report shall be transmitted to the Public Printer in time for his annual report to Congress. The Public Printer shall show in detail, in his annual report, the cost of operating each departmental office.

On the 14th day of February, 1895, you issued the following order designating in accordance with the above provisions of the law the chief of this division as the person to sign the blanks for work done in the branch office:

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., February 14, 1895.

SIR: The printing office of this Department having been transferred to the control of the Public Printer by the act approved January 12, 1895, which provides that all work done in the said office shall be ordered on blanks prepared for the purpose, numbered consecutively, and signed by some one designated by the head of the Department, I now, therefore, designate the Chief of the Division of Records and Editing as the person who shall sign such orders and be held responsible for work thus ordered, and prepare the quarterly report to the head of the Department as to the work done and the cost thereof, as provided by the act in question.

You are therefore directed to secure the necessary blanks and to take whatever measures may be necessary to insure compliance with the law.

Respectfully,

J. STERLING MORTON, *Secretary.*

MR. GEORGE WILLIAM HILL,
Chief Division of Records and Editing, Department of Agriculture.

Up to and including June 29 there have been issued from this division 425 orders for work upon the branch printing office, divided among the several divisions of the Department as follows: Accounts, 6; Agricultural Soils, 9; Agrostology, 4; Botany, 19; Bureau of Animal Industry, 42; Chief Clerk, 17; Chemistry, 6; Dairy, 6; Document and Folding Room, 13; Entomology, 16; Fiber Investigations, 1; Forestry, 10; Foreign Markets, 11; Gardens and Grounds, 4; Library, 7; Office of Experiment Stations, 31; Ornithology and Mammalogy, 12; Pomology, 6; Records and Editing, 29; Road Inquiry, 5; Seeds, 14; Statistics, 66; Stationery and Property, 17; Vegetable Pathology, 16; miscellaneous, 58; total, 425.

Cost of printing in branch office.—The cost of this office has, under the new law, been greatly increased. Hitherto the sum of \$5,400, provided for under the Seed Division, when supplemented by details from the Seed and other divisions of laborers to act as press feeders when work was pressing, had been sufficient to cover the expense of this branch office. The large increase in the wages paid under the new system, such wages being, it is understood, established by law on a basis conforming to the union scale of wages, has involved a great increase of expense. The first bill rendered under the new régime was for the period beginning with January 12 and ending February 27, and amounted to \$562.91. From February 28 to June 29, a period of four months, the bills rendered by the Public Printer for services and material aggregated \$5,390.65, a monthly average of \$1,347.91, or at the rate of over \$16,000 yearly. It is only proper to state that with the increased facilities more and better work has been done in the branch office than formerly, and also that a certain amount of the sum indicated has been for material furnished, which would under the former method have been supplied from the stationery supplies of the Department. At the same time the additional advantages secured have not been at all commensurate to the increased expense—the increase in the rate of remuneration having been very great and the opportunity for an economical utilization of help available in other divisions not having been possible.

Effects of the act of January 12, 1895.—It may be said here that in this respect the act of January 12, 1895, has been thoroughly consistent. Its effects, so far as they can be seen through the numerous contradic-

tions and inconsistencies with which the act fairly teems, seem to offer no advantages as a compensation for its numerous defects. So far as waste is concerned in the distribution of public documents, there is probably no manner of legislation which will prevent it as long as a system of wholesale free distribution is pursued, and a legal enactment under which the head of this Department would be authorized to affix a price to every document published by the Department for public use, except in the case of such as might be termed emergency publications, becomes more and more urgent as the publication work of this Department increases.

ILLUSTRATIONS.

The following letter sufficiently explains the relation of the Chief of this division to the work of illustrations:

UNITED STATES DEPARTMENT OF AGRICULTURE,
August 29, 1894.

SIR: I have assigned to the Assistant Secretary full charge and control over the appropriation under the act approved August 8, 1894, for illustrations and engravings, and I have instructed him that you have been detailed to assist him in such manner as he may direct in the administration of this fund, and you will therefore govern yourself accordingly.

Respectfully,

J. STERLING MORTON,
Secretary.

MR. GEORGE WILLIAM HILL,
Chief of Division of Records and Editing.

Assignment of artists.—During the year nine persons have been employed under the fund appropriated for illustrations and engraving, one in a clerical capacity and the others as artists. At the close of the fiscal year there were, however, but eight persons on the roll, one of the artists employed exclusively in the Division of Entomology having been transferred to the roll of that division. The plan adopted under the above order was to assign the several artists to various divisions, placing them under the control of the chiefs of such divisions, leaving the illustrations work of other divisions not having a sufficient amount of it to justify the employment of a special artist to be executed as opportunity offered by one or other of the artists assigned to particular divisions. This plan involved in every such case either a detail of the artist to another person or left the work where it did not amount to enough to justify a formal detail, dependent upon the good will of the chief of some division employing a special artist. Thanks to the accommodating character of these officers and the ready compliance of the artists themselves, this state of things has not occasioned any seriously detrimental results, but it has been a source of considerable annoyance and of actual vexation daily, besides taking up a great deal more of the time of the Chief of this division or of his first assistant than would otherwise have been necessary, and the method adopted and at present in force can not be regarded as satisfactory.

Cost of illustrations work.—The cost of the work has not been excessive, amounting altogether for the fiscal year to \$9,024.34, made up of the following items: Artists' materials, engraving, electrotyping, etc., \$2,054.61; salaries, \$6,975.40. How relatively economical the present arrangement is, in the light of these figures, can, however, only be fully determined by a careful comparison of the work actually done during the past fiscal year with that of the previous year. Under a method, however, which assigns all the artists to particular divisions the aggregate amount of work done is not known to any one person. It

should also be borne in mind that salaries and labor for illustrations are defrayed in several cases from divisional funds, of which no record is kept in this office, but from figures obtained through the courtesy of the disbursing office, the amount so expended is shown to be \$2,949.88, divided as follows:

Division of Botany	\$707.15
Division of Entomology.....	1,115.65
Farmers' Bulletin fund.....	7.50
Division of Ornithology and Mammalogy, lump fund.....	937.50
Division of Vegetable Pathology.....	182.08
Total.....	2,949.88

The above sum does not of course include salaries of persons doing artists' work and carried at a fixed salary on the division rolls.

MISCELLANEOUS WORK.

The general character of the work assigned to this division was so fully set forth in my last report as to make any further general statement on the subject unnecessary. The character of the additional work imposed by the duties resulting from the Farmers' Bulletins, the new Yearbook, the supervision of the branch printing office, and of illustrations has been no doubt sufficiently shown by the reference already made to those branches of the work. Apart from these no special additional duty has been undertaken save that occasioned by the preparation for the Atlanta Exposition, this division having been assigned, in conjunction with the Office of Experiment Stations, to serve at the Exposition as a bureau of information for the Department, and having been required to prepare an exhibit as per schedule attached. In connection with this, but going far beyond it, it is believed, in its permanently useful character, the work of preparing an index to the annual reports of the Department from the beginning was undertaken and at the close of the fiscal year was, together with the other work of preparing for the Exposition, fairly under way. This work has been long contemplated, its necessity generally recognized, and it has been the subject of earnest recommendation in former reports of this division. The work is being done intelligently and as fully as possible in the limited time available. When completed the index will cover all the annual reports of the Department, beginning with its inception in 1837 as a part of the Patent Office and including the last annual report (1893) published under the old system before the Yearbook was adopted as a substitute.

It is estimated from the work already done that as finally completed this index will make a book of about 175 pages, containing some 8,000 or 9,000 entries and over 12,000 references.

It is hardly necessary to add that the amount of work devolving upon the division force has been greatly increased over the previous year, and as the force was short by one man until last spring it has only been by means of considerable extra work, cheerfully contributed by the various members of the force, and by the sacrifice of every employee in the division of a considerable portion of the time customarily allowed to employees of the Department as leave of absence that it has been possible to accomplish it at all.

It becomes, therefore, my pleasing duty to bear unusually strong testimony to the intelligence and fidelity displayed by every member of the force. It is gratifying to have to record the fact that in the last appropriation bill provision was made for an increase in pay of two of my assistants.

ESTIMATES FOR ENSUING YEAR.

I have the honor to submit the following estimates for the next fiscal year for the several lines of work assigned this division:

Salaries.—Editor and Chief of division, \$2,500; assistant chief of division, \$1,800; editorial clerk, class 3, \$1,600; proof reader and indexer, class 2, \$1,400; one clerk, class 1, \$1,000; in all, \$8,300.

In lieu of the appropriation of \$15,000 for illustrations and engravings I desire to submit an amendment to my former recommendation, made on September 10, as follows:

Publications and illustrations.—For the pay of additional proofreaders and indexers, when necessary; for artists, draftsmen, and engravers; for the purchase of tools, instruments, and other artists' material; for labor and necessary traveling expenses; for drawings, paintings, engravings, lithographs, and other illustrations; and for printing and electrotyping; in all, \$30,000.

For general printing fund I submit herewith \$100,000, an increase of \$15,000.

For Farmers' Bulletins, \$50,000; and inasmuch as the main cost of distribution of these bulletins will have to come out of that fund I suggest that the usual appropriation for materials in document and folding room be made to include labor and increased to \$5,000.

The reasons for the increases asked for are fully set forth below.

In submitting estimates for the ensuing year only \$2,500 has been allowed for the salary of the Chief of the Division of Publications. In the estimates for the present year his remuneration was estimated at \$3,000 for reasons which were, it is believed, sound and satisfactory. The same reasons exist, and are, if possible, strengthened by the conditions of the duties at present imposed upon that officer. That the estimate for next year has not been made in accordance therewith is due to a conviction that no compliance with last year's recommendation can be reasonably hoped for except as the result of a recognition of the fact that the salaries of the higher officers of the Department and of the employees bearing the heaviest responsibilities and filling positions requiring not only intelligence and fidelity, but a high order of capacity, good judgment, and wide experience, are inadequate, and of the adoption of some general plan of revision by which salaries in the Government service shall be put upon an equal footing with those prevailing among private concerns of the best class, according to the nature of the services rendered.

I may be permitted to add that the highest good of the service can never be attained until it affords adequate inducements in the way of suitable reward for long, faithful, and exceptionally capable service.

INCREASE IN ILLUSTRATIONS.

The increase asked for illustrations is due to the necessity of having some one fund under the immediate control of the Secretary sufficient to cover all the illustrations work of the Department, instead of having a great part of that work provided for in an irregular manner, by the insertion, when possible, of a clause in the appropriations for the several divisions covering illustrations. The present appropriation of \$15,000, while it would have been nearly sufficient to cover all such work during the past year, is not large enough as an estimate for a fiscal year which will not terminate till June 30, 1897. It is, moreover,

earnestly recommended that the work of illustrations be assigned to a section of this division regularly organized, with a chief of section carefully selected for his experience in and knowledge of lithography, engraving, and other methods of illustrations suitable to publications of the Department—a person, in other words, possessing the same practical ability in this line of work as is possessed in regard to printing and book work by my present first assistant. I am satisfied that the employment of such a person and the organization of such a section, to be known as the “section of illustrations,” would result in efficiency and economy greatly exceeding the additional expense in the way of salary. Moreover, the experience of the past year has demonstrated that this matter of illustrations draws very heavily upon the time of the Chief and his first assistant; the latter, indeed, has cheerfully endeavored to shoulder a large share of the burden thus imposed upon the division, but it does not seem possible that he should continue in the future to devote so much personal time to this branch of the work.

INCREASE IN THE GENERAL PRINTING FUND.

It has been also found necessary to propose an increase in the estimate for the general printing fund. The reasons for this are twofold: First, the objections frequently urged against the authorization for printing in the appropriations for the several divisions, in which there has been no uniformity of wording, thus frequently raising a question as to whether this or that appropriation covers this expense; secondly, the fact that the greater portion of the large increase in running the branch printing office will be charged to this fund; for while it is possible in certain cases, involving very large jobs, to charge the same to special funds, this is not feasible with regard to a very considerable proportion of the work, and as the printing fund of \$5,400 included in the seed appropriation is ruled to be no longer available toward the expenses of the branch office, it seems certain that nearly all such expenses will be charged by the Public Printer against the general printing fund of the Department.

As the total expenses for printing, outside of the Farmers' Bulletins, amounted to nearly \$80,000 during the past year, and as the cost of the branch office, based upon the expense of the last third of the fiscal year covered by this report, will doubtless reach \$16,000, it is evidently necessary to ask for \$100,000 for the next fiscal year.

FURTHER RECOMMENDATIONS.

I have the honor to submit the following further recommendation with reference to the future work of the division:

The index of the annual reports of the Department, prepared with considerable difficulty and pains, will, I am satisfied, prove so useful that the necessity for a complete index of all the publications of the Department will be more fully appreciated and called for. Apart from its value to the public, it should be of great use to the workers in the several branches of the Department itself, and especially, perhaps, to the chief executive officers controlling all the scientific work. As this is work that when completed could no doubt be attached to and maintained by the library staff, no special provision is asked for the help necessary to execute it; but should its execution be approved, it is believed that with such assistance as might be detailed from other divisions, all of whom are interested in the work, it might be under-

taken and brought up to date under the direction of this division and the personal supervision of Mr. George F. Thompson, my second assistant, who has had special charge of the work already done in this line.

DISTRIBUTION OF FARMERS' BULLETINS.

In regard to the distribution of Farmers' Bulletins, it would be a great relief to this division were it possible to relieve it of the large amount of correspondence and bookkeeping involved, especially in the distribution through Members of Congress. Inasmuch as this fund is a part of the seed appropriation, and in view of the fact that the force directly in charge of the seed distribution seems likely to have less onerous duties to perform in the future than in the past, it is earnestly recommended that the distribution of Farmers' Bulletins be confided to the Chief of the Seed Division. This would seem to be especially in line with the provision of the law which provides that the Farmers' Bulletins are to be distributed "as seed is distributed."

SALE OF DOCUMENTS.

With reference to the sale of our documents, I can only repeat the recommendations made in several former reports with all the added emphasis due to additional experience, which in every particular confirms the conclusion first expressed in my report for 1891, namely, that the head of the Department be authorized to charge a reasonable price for them. This would afford a simple and practical solution of the many and increasing difficulties attending the distribution of the numerous publications issued by the Department, a discriminating distribution of which becomes daily more perplexing.

ADDITIONAL ROOM.

I regret, in view of the inadequate accommodations at your disposal for carrying on the work of the Department, to be compelled to add to your embarrassment by an urgent appeal for more room. The transaction of business with a large number of the divisions involved by the very nature of our work and increased during the last year by the addition of the Farmers' Bulletins and the illustrations work, and especially by the supervision of the work of the branch printing office, results in converting the main office of the division into a regular business office, which, together with the typewriter in the same room, and sometimes two typewriters in operation at the same time, utterly unfits it for use in editorial, proof reading, and indexing work. At least two of my assistants should be accommodated permanently with desks in a room devoted exclusively to that sort of work and from which the noise and interruptions inevitably accompanying the general transaction of business should be rigidly excluded.

While my first assistant should have his desk in the business office he should also have a working table available in the other room, to which he could retire when engaged upon work necessitating uninterrupted quiet. If it were possible to make some arrangement by which the small office adjoining our main room on the west could be turned over to this division there would be a very great gain in saving of time and efficiency of work. The crowding together of people engaged in different kinds of work and unavoidably disturbing one another in the performance of their duties is antagonistic to the two chief desiderata of every form of administration—efficiency and economy.

AN ADVISORY BOARD.

In conclusion, I desire to make the suggestion that an advisory board be appointed by the Secretary to decide all questions arising in regard to orthography, capitalization, and hyphenization, upon which, unfortunately, so many good authorities differ, and which consequently take up a great deal of time in discussion and not infrequently provoke a little friction when decided, owing to the fact that it seems arbitrary and dogmatic for one man to decide without appeal, questions upon which there is a difference of opinion among good authorities. Simply as a matter of business such a board, if properly selected, would save much time and facilitate work; furthermore, it would secure a most desirable result, namely, uniformity of practice in all publications of the Department.

It seems likely that were such a course to be pursued in this Department the result would invite an extension of the plan to other Departments, and finally, perhaps, the establishment of a central board composed of the chairmen of the several Department boards, whose rulings in such matters should be final and binding upon the Public Printer, who would be charged with enforcing them in all publications of the Government.

PUBLICATIONS OF THE YEAR.

OFFICE OF THE SECRETARY.

	Copies.
Suggestions Regarding the Cooking of Food. By Edward Atkinson. With Introductory Statements Regarding the Nutritive Value of Common Food Materials. By Mrs. Ellen H. Richards. Pp. 31, figs. 3. August, 1894..	10, 000
Special Report of the Assistant Secretary of Agriculture for 1893. By Edwin Willits. Pp. iv, 53-86. (From the Annual Report of the Secretary of Agriculture.) August, 1894.....	100
Report of the Secretary of Agriculture for 1893. Pp. 608, pls. 29, figs. 7. October, 1894.....	500, 000
Report of the Secretary of Agriculture for 1894. Preliminary. Pp. 75, fig. 1. November, 1894.....	10, 000
Reprint, December, 1894.....	10, 000
Washed Soils: How to Prevent and Reclaim Them. Pp. 22, figs. 6. Farmers' Bulletin No. 20. November, 1894.....	50, 000
Reprint, May, 1895.....	18, 000
Supplement to the General Index of the Agricultural Reports for the Years 1877 to 1885, Inclusive. Pp. 113. (Reprint.) March, 1895.....	200
A General Index to the Agricultural Reports of the Patent Office for Twenty-five Years, from 1837 to 1876. Pp. 225. (Reprint.) April, 1895.....	200
The World's Markets for American Products.—Great Britain and Ireland. Pp. 93, fig. 1. Bulletin No. 1, Section of Foreign Markets. May, 1895....	10, 000
Report of the Secretary of Agriculture; being part of the Messages and Documents Communicated to the Two Houses of Congress at the Beginning of the Third Session of the Fifty-third Congress. Pp. 220, figs. 2. May, 1895.....	3, 000
Peaches and Other Fruits in England. Pp. 4. Circular No. 1, Section of Foreign Markets. June, 1895.....	10, 000
The World's Markets for American Products.—The German Empire. Pp. 91, pl. 1. Bulletin No. 2, Section of Foreign Markets. June, 1895.....	10, 000
Report of the Special Agent for the Purchase of Seeds for 1894. By Enos S. Harnden. Pp. iii, 211-213. (From the Annual Report of the Secretary of Agriculture.) March, 1895.....	500

DIVISION OF ACCOUNTS AND DISBURSING OFFICE.

Report of the Chief of the Division of Accounts and Disbursements for 1893. By F. L. Evans. Pp. iii, 411-415. (From the Annual Report of the Secretary of Agriculture.) August, 1894.....	100
Report of the Chief of the Division of Accounts and Disbursements for 1894. By F. L. Evans. Pp. iii, 189-194. (From the Annual Report of the Secretary of Agriculture.) March, 1895.....	500

BUREAU OF ANIMAL INDUSTRY.

	Copies.
Additional Investigations Concerning Infectious Swine Diseases. By Theobald Smith, Ph. B., M. D., and Veranus A. Moore, B. S., M. D. Pp. 117. Bulletin No. 6. July, 1894.....	3, 000
Report of the Chief of the Bureau of Animal Industry for 1893. By D. E. Salmon. Pp. iii, 123-168. (From the Report of the Secretary of Agriculture.) August, 1894.....	100
Wheat as a Food for Growing and Fattening Animals. By D. E. Salmon, D. V. M. Pp. 4. Circular of Information No. 2. August, 1894....	10, 000
Reprint, September, 1894.....	5, 000
Reprint, November, 1894.....	10, 000
Investigations Concerning Bovine Tuberculosis, with Special Reference to Diagnosis and Prevention. Conducted under the direction of Dr. D. E. Salmon, Chief of the Bureau of Animal Industry. Pp. 178, pls. 6. October, 1894.....	5, 000
Hog Cholera and Swine Plague. By D. E. Salmon, D. V. M., Chief of the Bureau of Animal Industry. Pp. 16. Farmers' Bulletin No. 24. December, 1894.....	10, 000
Reprint, December, 1894.....	60, 000
Reprint, March, 1895.....	20, 000
Regulations for the Inspection of Live Stock and their Products. Pp. 8. Circular. June, 1895.....	2, 000

DIVISION OF BOTANY.

Report of the Botanist for 1893. By Frederick V. Coville. Pp. iii, 235-244. (From the Annual Report of the Secretary of Agriculture.) August, 1894..	2, 100
Nut Grass. Pp. 4, fig. 1. Circular No. 2. October, 1894.....	5, 000
The Russian Thistle. Pp. 8, figs. 3. Circular No. 3. January, 1895.....	10, 000
Contributions from the United States National Herbarium, Vol. I, No. 9. Report on a collection of plants made in the States of Sonora and Colima, Mexico, by Dr. Edward Palmer, in the years 1890 and 1891. By J. N. Rose, Assistant Botanist. Pp. v, 293-434, viii, frontispiece, pls. 24-35, figs. 10. January, 1895.....	2, 500
American Ginseng: Its Commercial History, Protection, and Cultivation. Pp. 22, figs. 2. By George V. Nash. Bulletin No. 16. February, 1895..	3, 000
The Flat Pea. Pp. 7, figs. 2. Circular No. 4. March, 1895.....	3, 000
Giant Knotweed, or Sachaline. Pp. 4, figs. 3. Circular No. 5. March, 1895.	3, 000
Weeds; and How to Kill Them. Lyster H. Dewey, Assistant Botanist. Pp. 31, figs. 11. Farmers' Bulletin No. 28. May, 1895.....	20, 000
Report of the Botanist for 1894. By Frederick V. Coville. Pp. iii, 161-166. (From the Annual Report of the Secretary of Agriculture.) May, 1895..	500

GARDENS AND GROUNDS.

Papers on Horticultural and Kindred Subjects. By William Saunders, Horticulturist and Landscape Gardener, Superintendent of Gardens and Grounds. Pp. 124. (Reprint.) November, 1894.....	5, 000
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OFFICE OF EXPERIMENT STATIONS.

Forage Plants for the South. By S. M. Tracy, M. S., Director of the Mississippi Agricultural Experiment Station. Pp. 30, figs. 17. Farmers' Bulletin No. 18. August, 1894.....	50, 000
Reprint, May, 1895.....	20, 000
Proceedings of the Seventh Annual Convention of the Association of American Agricultural Colleges and Experiment Stations, held at Chicago, Ill., October 17-19, 1893. Pp. 100. Bulletin No. 20. August, 1894.....	4, 000
Report of the Director of the Office of Experiment Stations for 1893. By A. C. True. Pp. iv, 417-464. (From the Annual Report of the Secretary of Agriculture.) August, 1894.....	1, 100
Handbook of Experiment Station Work. A Popular Digest of the Publications of the Agricultural Experiment Stations in the United States. Prepared by the Office of Experiment Stations. Pp. 411. Bulletin No. 15. (Reprint.) November, 1894.....	3, 000
Barnyard Manure. By W. H. Beal, of the Office of Experiment Stations. Pp. 32, figs. 7. Farmers' Bulletin No. 21. November, 1894.....	20, 000
Reprint, January, 1895.....	80, 000
Reprint, May, 1895.....	65, 000
Milk Fermentations and Their Relations to Dairying. Prepared in the Office of Experiment Stations from Bulletin No. 9. Pp. 24. Bulletin No. 9. (Reprint.) January, 1895.....	20, 000
Reprint, April, 1895.....	15, 000

	Copies.
Foods: Nutritive Value and Cost. By W. O. Atwater, Ph. D., Professor of Chemistry in Wesleyan University. Pp. 32, charts 2. Farmers' Bulletin No. 23. January, 1895	50,000
Reprint, April, 1895	15,000
Tobacco: Instructions for its Cultivation and Curing. By John M. Estes, Special Agent. Pp. 8. Farmers' Bulletin No. 6. (Reprint.) February, 1895	10,000
Reprint, March, 1895	25,000
Reprint, May, 1895	18,000
The Feeding of Farm Animals. By E. W. Allen, Ph. D., Assistant Director of the Office of Experiment Stations. Pp. 32. Farmers' Bulletin No. 22. February, 1895	60,000
Reprint, March, 1895	40,000
Reprint, May, 1895	50,000
Peanuts: Culture and Uses. By R. B. Handy, of the Office of Experiment Stations. Pp. 24, fig. 1. Farmers' Bulletin No. 25. February, 1895	10,000
Reprint, May, 1895	18,000
Reprint, June, 1895	18,000
Fertilizers for Cotton. By J. M. McBryde, Ph. D., President of Virginia Agricultural and Mechanical College and Director of Virginia Agricultural Experiment Station. Pp. 31. Farmers' Bulletin No. 14. (Reprint.) February, 1895	10,000
Reprint, April, 1895	15,000
A Compilation of Analyses of American Feeding Stuffs. By E. H. Jenkins, Ph. D., and A. L. Winston, Ph. B. Pp. 155. Bulletin No. 11. (Reprint.) February, 1895	1,000
Leguminous Plants for Green Manuring and for Feeding. By E. W. Allen, Ph. D., Assistant Director of the Office of Experiment Stations. Pp. 24. Farmers' Bulletin No. 16. (Reprint.) March, 1895	25,000
Reprint, May, 1895	30,000
The Rape Plant: Its History, Culture, and Uses. By Thomas Shaw, Professor of Agriculture in the Ontario Agricultural College. Pp. 20, figs. 4. Farmers' Bulletin No. 11. (Reprint.) March, 1895	10,000
Reprint, May, 1895	5,000
Sweet Potatoes: Culture and Uses. By J. F. Duggar, of the Office of Experiment Stations. Pp. 30, figs. 4. Farmers' Bulletin No. 26. March, 1895	15,000
Reprint, April, 1895	18,000
Reprint, June, 1895	25,000
Report of the Director of the Office of Experiment Stations for 1894. By A. C. True. Pp. iii, 123-131. (From the Annual Report of the Secretary of Agriculture.) April, 1895	1,000
Organization Lists of the Agricultural Experiment Stations and Institutions with Courses in Agriculture in the United States. Pp. 88. Bulletin No. 23. May, 1895	3,000
Methods and Results of Investigations on the Chemistry and Economy of Food. By W. O. Atwater, Ph. D., Professor of Chemistry in Wesleyan University, Director of the Storrs (Conn.) Agricultural Experiment Station, and Special Agent of the United States Department of Agriculture. Pp. 222, figs. 15, charts 3. Bulletin No. 21. May, 1895	3,000
Statistics of Agricultural Colleges and Experiment Stations, 1894. Pp. 18. Circular No. 27. June, 1895	5,000
Experiment Station Record. (A condensed record of the contents of the bulletins and reports issued by the Agricultural Experiment Stations of the United States, and also a brief review of agricultural science of the world.)	
Vol. V, No. 6. Pp. viii, 547-666. (Reprint.) June, 1895	500
Vol. V, No. 7. Pp. vi, 667-744. (Reprint.) July, 1894	1,000
Reprint, May, 1895	500
Vol. V, No. 11. Pp. v, 395-444, July, 1894	8,000
Reprint, May, 1895	500
Vol. VI, No. 1. Pp. vi, 88. September, 1894	8,000
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Vol. VI, No. 5. Pp. viii, 349-488. March, 1895	8,000
Vol. VI, No. 6. Pp. vii, 489-584. April, 1895	8,000
Vol. VI, No. 7. Pp. vi, 585-678, figs. 3. May, 1895	8,000
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Vol. VI, No. 9. Pp. vi, 759-850. June, 1895	8,000
Vol. VI, No. 10. Pp. vi, 851-944. June, 1895	8,000

DIVISION OF CHEMISTRY.

	Copies.
The Manufacture of Sorghum Sirup. Pp. 3. Circular No. 1. July, 1894.	10, 000
Report of the Chemist for 1893. By H. W. Wiley. Pp. iv, 169-198. (From the Annual Report of the Secretary of Agriculture.) August, 1894.....	100
Report on the Extent and Character of Food and Drug Adulteration. By Alex. J. Wedderburn, Special Agent. Published by order of Congress. Pp. 64. Bulletin No. 41. October, 1894.....	2, 500
A Compilation of the Pharmacy and Drug Laws of the Several States and Territories. By Alex. J. Wedderburn, Special Agent. Published by order of Congress. Pp. 152. Bulletin No. 42. November, 1894.....	2, 500
Proceedings of the Eleventh Annual Convention of the Association of Official Agricultural Chemists, held at Washington, D. C., August 23, 24, and 25, 1894. Edited by Harvey W. Wiley, Secretary of the Association. Pp. 403. Bulletin No. 43. December, 1894.....	3, 500
Experiments with Sugar Beets in 1892. By Harvey W. Wiley, Chief Chemist of the United States Department of Agriculture and Director of the Department Sugar Experiment Stations at Schuyler, Nebraska; Runnymede (Narcoossee P. O.), Florida, and Sterling and Medicine Lodge, Kansas. With the collaboration of Dr. Walter Maxwell, Assistant in charge of the Schuyler Station. Pp. 74. Bulletin No. 36. (Reprint.) December, 1894.....	500
Experiments with Sugar Beets in 1890. By Harvey W. Wiley, Chief Chemist of the United States Department of Agriculture and Director of the Department Sugar Stations at Schuyler, Nebraska; Runnymede (Narcoossee P. O.), Florida, and Sterling and Medicine Lodge, Kansas. Pp. 93. Bulletin No. 30. (Reprint.) December, 1894.....	500
Proceedings of the Ninth Annual Convention of the Association of Official Agricultural Chemists, held at the National Museum, Washington, D. C., August 25, 26, and 27, 1892. Edited by Harvey W. Wiley, Secretary of the Association. Pp. v, 243, xvii. Bulletin No. 35. (Reprint.) December, 1894.....	500
Proceedings of the Seventh Annual Convention of the Association of Official Agricultural Chemists, held at the United States National Museum, August 28, 29, and 30, 1890. Methods of Analysis of Commercial Fertilizers, Foods and Feeding Stuffs, Dairy Products, Fermented Liquors and Sugars. Edited by Harvey W. Wiley, Secretary of the Association. Pp. 238, figs. 21. Bulletin No. 28. (Reprint.) December, 1894.....	500
Experiments with Sugar Beets in 1893. By Harvey W. Wiley, Chemist of the United States Department of Agriculture and Director of the Department Sugar Experiment Stations at Schuyler, Nebraska; Runnymede (Narcoossee P. O.), Florida, and Sterling and Medicine Lodge, Kansas. With the collaboration of Dr. Walter Maxwell, Assistant in charge of the Schuyler Station. Pp. 59. Bulletin No. 39. (Reprint.) December, 1894..	500
Foods and Food Adulterants. Fermented Alcoholic Beverages, Malt Liquors, Wines, and Cider. By C. A. Crampton, Assistant Chemist. Pp. 261-399, figs. 2. Bulletin No. 13, Part III. (Reprint.) December, 1894..	500
Sweet Cassava: Its Culture, Properties, and Uses. By Harvey W. Wiley, Chemist of the United States Department of Agriculture. Pp. 16, pls. 2, fig. 1. Bulletin No. 44. January, 1895.....	5, 000
The Sugar Beet Industry. Culture of the Sugar Beet and Manufacture of Beet Sugar. By H. W. Wiley, Chemist. Pp. 262, pls. 11, figs. 49. Bulletin No. 27. (Reprint.) January, 1895.....	500
Nostrums for Increasing the Yield of Butter. By Harvey W. Wiley, Chemist of the United States Department of Agriculture. Pp. 16. Farmers' Bulletin No. 12. (Reprint.) January, 1895.....	15, 000
Reprint, May, 1895.....	12, 000
Record of Experiments with Sorghum in 1892. By Harvey W. Wiley, Chemist of the United States Department of Agriculture and Director of the Department Sugar Experiment Stations at Schuyler, Nebraska; Runnymede (Narcoossee P. O.), Florida, and Sterling and Medicine Lodge, Kansas. With the collaboration of Messrs. A. A. Denton, Glen O'Brien, C. I. Hinman, Wibray J. Thompson, J. L. Fuelling, and Oma Carr. Pp. 100. Bulletin No. 37. (Reprint.) February, 1895.....	500
Foods and Food Adulterants. Spices and Condiments. By Clifford Richardson. Pp. ii, 129-259, pls. 13-28, figs. 5-13. Bulletin No. 13, Part II. (Reprint.) February, 1895.....	500
Culture of the Sugar Beet. By H. W. Wiley, Chemist of the Department of Agriculture and Director of the Department Sugar Experiment Station in Nebraska. Pp. 24, figs. 9. Farmers' Bulletin No. 3. (Reprint.) April, 1895.....	15, 000

DIVISION OF ENTOMOLOGY.

	Copies.
The Army Worm (<i>Leucania unipuncta</i> Haw.) Pp. 5, figs. 3. Circular No. 4, second series. July, 1894.....	5,000
Important Insecticides: Directions for Their Preparation and Use. By C. L. Marlatt, First Assistant Entomologist. Pp. 20. Farmers' Bulletin No. 19. July, 1894.....	5,000
Reprint, September, 1894.....	10,000
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Improvement of Public Roads in North Carolina. By Prof. J. A. Holmes, State Geologist.

APPENDIX.

Organization of the Department of Agriculture.

Agricultural institutions and experiment stations; List of institutions in the United States having courses in agriculture.

The locations, directors, dates of organization and reorganization, and principal lines of work of the agricultural experiment stations in the United States.

Weather conditions of the crop of 1894.

Directions for procedure in case of apparent death by lightning.

Wholesale prices of principal agricultural products in the leading cities of the United States.

Export of the products of domestic agriculture for the years ending June 30, 1890, 1891, 1892, 1893, and 1894.

Imports of agricultural products for the years ending June 30, 1890, 1891, 1892, 1893, and 1894.

Farm prices on December 1, 1890, 1891, 1892, 1893, and 1894.

Freight rates in effect January 1, 1891, 1892, 1893, 1894, 1895, in cents per 100 pounds.

Human foods: Composition of different food materials—refuse, water, nutrients—and fuel value per pound; Nutrients obtained for 10 cents in different foods at ordinary prices; Prices used in estimating cost of daily dietaries; Daily dietaries—food materials furnishing approximately the 0.28 pound of protein and 3,500 calories of energy of the standard for daily dietary of a man at moderate muscular work; Standards for daily dietaries for people of different classes; European standards for daily dietaries; American standards for daily dietaries.

Feeding stuffs for animals; Composition and digestibility.

Feeding standards.

Calculation of rations.

Fertilizing constituents of feeding stuffs and farm products.

Fertilizers.

Amount and value of manure produced by different farm animals.

Methods of controlling injurious insects, with formulas for insecticides.

Insecticides (directions for their preparation and use).

A cheap orchard-spraying outfit.

Treatment for fungous diseases of plants; Formulas for fungicides.

Grasses as sand and soil binders.

Table of one hundred weeds.

Farmers' Bulletins.

Publications of the Department of Agriculture.

EXHIBIT AT COTTON STATES AND INTERNATIONAL EXPOSITION, ATLANTA, GA.

Complete set of the publications of the United States Department of Agriculture from its inception as a section of the Patent Office (1837) to and including 1895, arranged by bureaus and divisions, and distinctively bound.

Publications of the Department of Agriculture, in divisional groups, for reference and examination. This set is not complete, but will serve to illustrate the character and scope of the Department publications.

Copies of Farmers' Bulletins for miscellaneous distribution.

A practical illustration in bookmaking, using the Yearbook of the United States Department of Agriculture for 1894 as an example. This exhibit illustrates the various processes of the work, from the submission of the manuscript to the completed volume; illustrations in various forms, from the original drawing to the finished wood engraving; pen and ink drawings; water-color paintings; the first publication of the Department of Agriculture; handsomely bound set of Farmers' Bulletins (Nos. 1-27).

Portraits of Hon. Norman J. Colman, Hon. J. M. Rusk, and Hon. J. Sterling Morton. Bust of Hon. J. Sterling Morton, Secretary of Agriculture.

Drawings and paintings in swinging frames. This exhibit represents the work of the various artists in the employ of the Department.

REPORT OF THE CHIEF OF THE DIVISION OF ACCOUNTS AND DISBURSEMENTS.

SIR: I have the honor to submit herewith a brief summary of the work of the Division of Accounts and Disbursements for the fiscal year ending June 30, 1895; also, a statement of appropriations, disbursements, and unexpended balances of the United States Department of Agriculture from fiscal year 1839 to and including the fiscal year 1894.

Very respectfully,

F. L. EVANS,

Chief.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE YEAR.

The amount appropriated by Congress for the maintenance of the United States Department of Agriculture for the year 1895 was \$2,499,023.06, being \$104,476.94 less than the appropriation for 1894 and \$183,420 more than was asked for by the Department in the Estimates of Appropriations. To this sum was added, for statutory salaries, \$7,891.94, or thirty-eight-three hundred and sixty-fifths of the amount for statutory salaries for the previous year. This addition was made necessary by the continuation of the previous year's appropriation pending the action of Congress for the support of the Department for the year 1895, the appropriation bill not being finally passed until August 8, 1894. The appropriation in detail, divided into thirty-one subheads, each representing an appropriation for a specific purpose, is shown in the following table:

Appropriations, 1895.	Amounts appropriated.	Amounts disbursed.	Amounts unexpended.
Salaries	\$243, 600. 00	\$204, 589. 72	\$39, 010. 28
Collecting agricultural statistics	110, 000. 00	93, 249. 78	16, 750. 22
Botanical investigations and experiments	30, 000. 00	24, 720. 59	5, 279. 41
Investigating the history and habits of insects	20, 300. 00	15, 969. 02	4, 330. 98
Investigations in ornithology, etc.	17, 500. 00	13, 982. 43	3, 517. 57
Pomological information	5, 000. 00	4, 895. 36	104. 64
Microscopical investigations	2, 000. 00	310. 41	1, 689. 59
Vegetable pathological investigations, etc.	20, 000. 00	17, 326. 05	2, 673. 95
Laboratory	14, 900. 00	10, 669. 81	4, 230. 19
Fiber investigations	5, 000. 00	3, 455. 21	1, 544. 79
Report on forestry	20, 000. 00	19, 753. 63	246. 37
Illustrations and engravings	15, 000. 00	8, 735. 21	6, 264. 79
Purchase and distribution of valuable seeds	165, 400. 00	111, 992. 01	53, 407. 99
Document and folding room	2, 000. 00	1, 024. 43	975. 57
Experimental gardens and grounds	29, 500. 00	23, 303. 51	6, 196. 49
Museum	3, 000. 00	1, 889. 73	1, 110. 27
Furniture, cases, and repairs	10, 000. 00	7, 443. 33	2, 556. 67
Library	6, 000. 00	3, 408. 11	2, 591. 89
Postage	5, 000. 00	765. 00	4, 235. 00
Nutrition investigations	10, 000. 00	8, 243. 82	1, 756. 18
Contingent expenses	25, 000. 00	18, 790. 52	6, 209. 48
Agricultural experiment stations	25, 000. 00	24, 110. 26	889. 74
Inquiries relating to public roads	10, 000. 00	6, 744. 46	3, 255. 54
Experiments in the manufacture of sugar	10, 000. 00	5, 103. 87	4, 896. 13
Irrigation investigations	6, 000. 00	3, 164. 27	2, 835. 73
Quarantine stations for neat cattle	12, 000. 00	5, 450. 98	6, 549. 02
Bureau of Animal Industry	800, 000. 00	491, 741. 16	308, 258. 84
Total	1, 622, 200. 00	1, 130, 832. 68	491, 367. 32

Appropriations, 1895.	Amounts appropriated.	Amounts disbursed.	Amounts unexpended.
WEATHER BUREAU.			
Salaries	\$164,290.00	\$146,950.54	\$17,339.46
Fuel, light, and repairs	8,000.00	6,758.60	1,241.40
Contingent expenses	10,000.00	4,189.93	5,810.07
General expenses, salaries	347,195.00	337,430.22	9,764.78
General expenses, miscellaneous	347,338.06	182,015.18	165,322.88
Total	876,823.06	677,344.47	199,478.59
Grand total	2,499,023.06	1,808,177.15	690,845.91

The total amount expended during the year 1895 was \$2,013,601.92. Of this sum \$1,808,177.15 was from the appropriation of 1895 and \$205,424.77 was in payment of supplemental accounts for the years 1893 and 1894.

The accompanying table presents the several amounts as estimated and as actually appropriated for the year 1895, together with the increase or decrease in these funds, and shows that a much larger amount was appropriated than was estimated for by the Department.

Appropriations.	Amount estimated for 1896.	Amount appropriated 1896.	Increase.	Decrease.
Salaries, officers and clerks	\$209,320.00	\$222,840.00	\$13,520.00	.....
Messengers, laborers, mechanics, etc	20,000.00	20,000.00	.....	.....
Additional assistants in laboratory	10,000.00	10,000.00	.....	.....
Collecting agricultural statistics	100,000.00	100,000.00	.....	.....
Investigating foreign demands for United States agricultural products	10,000.00	10,000.00	.....	.....
Inquiries relating to public roads	10,000.00	10,000.00	.....	.....
Botanical investigations and experiments	25,000.00	25,000.00	.....	.....
Investigating the history and habits of insects	20,000.00	20,000.00	.....	.....
Investigations in ornithology and mammalogy	17,500.00	17,500.00	.....	.....
Pomological information	6,000.00	6,000.00	.....	.....
Microscopical investigations	2,000.00	2,000.00	.....	.....
Vegetable pathological investigations and experiments	20,000.00	20,000.00	.....	.....
Laboratory	4,000.00	4,000.00	.....	.....
Rent, laboratory buildings	900.00	900.00	.....	.....
Investigation of soils	5,000.00	5,000.00	.....	.....
Adulteration of food	5,000.00	5,000.00	.....	.....
Report on forestry	25,000.00	25,000.00	.....	.....
Illustrations and engravings	15,000.00	15,000.00	.....	.....
Document and folding room	2,000.00	2,000.00	.....	.....
Experimental gardens and grounds	26,000.00	29,500.00	3,500.00	.....
Quarantine stations for neat cattle	12,000.00	12,000.00	.....	.....
Purchase and distribution of valuable seeds	(*)	130,000.00	130,000.00	.....
Farmers' Bulletins	50,000.00	50,000.00	.....	.....
Printing	6,000.00	5,400.00	.....	\$600.00
Experiments in the manufacture of sugar	10,000.00	10,000.00	.....	.....
Agricultural experiment stations	30,000.00	30,000.00	.....	.....
Irrigation investigations	8,000.00	15,000.00	7,000.00	.....
Nutrition investigations	15,000.00	15,000.00	.....	.....
Investigations and experiments with grasses, etc.	15,000.00	15,000.00	.....	.....
Investigations in relation to agricultural soils	15,000.00	15,000.00	.....	.....
Furniture, cases, and repairs	10,000.00	10,000.00	.....	.....
Postage	2,000.00	2,000.00	.....	.....
Museum	3,000.00	3,000.00	.....	.....
Fiber investigations	(*)	5,000.00	5,000.00	.....
Library	6,000.00	6,000.00	.....	.....
Contingent expenses	25,000.00	25,000.00	.....	.....
Bureau of Animal Industry	800,000.00	800,000.00	.....	.....
Total	1,539,720.00	1,698,140.00	159,020.00	600.00
WEATHER BUREAU.				
Salaries	164,290.00	164,290.00	.....	.....
Fuel, light, and repairs	8,000.00	8,000.00	.....	.....
Contingent expenses	10,000.00	10,000.00	.....	.....
General expenses, salaries	347,195.00	347,195.00	.....	.....
General expenses, miscellaneous	331,125.00	356,125.00	25,000.00	.....
Total	860,610.00	885,610.00	25,000.00	.....
Grand total	2,400,330.00	2,585,750.00	184,020.00	600.00

* Omitted from estimates.

The appropriations for 1895 and 1896 appear in detail below. It will be seen that the amount appropriated for 1896 is larger by \$84,726.94 than that appropriated for 1895:

Appropriations.	Amount appropriated.		Increase.	Decrease.
	1895.	1896.		
Salaries, officers and clerks.....	\$213, 600.00	\$222, 840.00	\$9, 240.00	.....
Messengers, laborers, mechanics, etc.....	20, 000.00	20, 000.00	.....	.....
Additional assistants in laboratory.....	10, 000.00	10, 000.00	.....	.....
Collecting agricultural statistics.....	100, 000.00	100, 000.00	.....	.....
Investigating foreign demands for United States agricultural products.....	10, 000.00	10, 000.00	.....	.....
Inquiries relating to public roads.....	10, 000.00	10, 000.00	.....	.....
Botanical investigations and experiments.....	30, 000.00	25, 000.00	.....	\$5, 000.00
Investigating the history and habits of insects.....	20, 300.00	20, 000.00	.....	300.00
Investigations in ornithology and mammalogy.....	17, 500.00	17, 500.00	.....	.....
Pomological information.....	5, 000.00	6, 000.00	1, 000.00	.....
Microscopical investigations.....	2, 000.00	2, 000.00	.....	.....
Vegetable pathological investigations and ex- periments.....	20, 000.00	20, 000.00	.....	.....
Laboratory.....	6, 000.00	4, 000.00	.....	2, 000.00
Rent of laboratory buildings.....	900.00	900.00	.....	.....
Investigation of soils.....	3, 000.00	5, 000.00	2, 000.00	.....
Adulteration of food.....	5, 000.00	5, 000.00	.....	.....
Report on forestry.....	20, 000.00	25, 000.00	5, 000.00	.....
Illustrations and engravings.....	15, 000.00	15, 000.00	.....	.....
Document and folding room.....	2, 000.00	2, 000.00	.....	.....
Experimental gardens and grounds.....	29, 500.00	29, 500.00	.....	.....
Quarantine stations for neat cattle.....	12, 000.00	12, 000.00	.....	.....
Purchase and distribution of valuable seeds.....	130, 000.00	130, 000.00	.....	.....
Farmers' Bulletins.....	30, 000.00	50, 000.00	20, 000.00	.....
Printing.....	5, 400.00	5, 400.00	.....	.....
Experiments in the manufacture of sugar.....	10, 000.00	10, 000.00	.....	.....
Agricultural experiment stations.....	25, 000.00	30, 000.00	5, 000.00	.....
Irrigation investigations.....	6, 000.00	15, 000.00	9, 000.00	.....
Nutrition investigations.....	10, 000.00	15, 000.00	5, 000.00	.....
Investigations and experiments with grasses and forage plants.....	.....	15, 000.00	15, 000.00	.....
Investigations in relation to agricultural soils.....	.....	15, 000.00	15, 000.00	.....
Furniture, cases, and repairs.....	10, 000.00	10, 000.00	.....	.....
Postage.....	5, 000.00	2, 000.00	.....	3, 000.00
Museum.....	3, 000.00	3, 000.00	.....	.....
Fiber investigations.....	5, 000.00	5, 000.00	.....	.....
Library.....	6, 000.00	6, 000.00	.....	.....
Contingent expenses.....	25, 000.00	25, 000.00	.....	.....
Bureau of Animal Industry.....	800, 000.00	800, 000.00	.....	.....
Total.....	1, 622, 200.00	1, 698, 140.00	86, 240.00	10, 300.00
WEATHER BUREAU.				
Salaries.....	164, 290.00	164, 290.00	.....	.....
Fuel, light, and repairs.....	8, 000.00	8, 000.00	.....	.....
Contingent expenses.....	10, 000.00	10, 000.00	.....	.....
General expenses, salaries.....	347, 195.00	347, 195.00	.....	.....
General expenses, miscellaneous.....	347, 358.06	356, 125.00	8, 786.94	.....
Total.....	876, 823.06	885, 610.00	8, 786.94	.....
Grand total.....	2, 499, 023.06	2, 583, 750.00	95, 026.94	10, 300.00

By making three divisions of the appropriations and expenses of the Department, we have the following for the year 1895:

	Amount appropriated.	Amount expended.
Bureau of Animal Industry.....	\$800, 000.00	\$491, 741.16
Weather Bureau.....	876, 823.06	677, 344.47
Divisional.....	822, 200.00	639, 091.52
Total.....	2, 499, 023.06	1, 808, 177.15

Twelve thousand six hundred and nineteen accounts were received, audited, and paid during the year ending June 30, 1895. During the same period 20,461 checks were drawn and transmitted from this office,

covering an infinite variety of payments for supplies, salaries, etc., and involving a sum of \$2,013,601.92. Seventy-nine requisitions were made on the United States Treasury to cover this amount. Twenty-three thousand four hundred and sixteen letters were written and received. One thousand two hundred and forty-seven letters of authority were issued for traveling and other expenses to employees of the Department. Three thousand eight hundred and seventy-one requisitions for supplies were issued. Nine hundred and eighty-five requests for passenger transportation were issued to agents traveling on business of the Department. A new and simple form for passenger transportation has been adopted by this office, and is now in use by the several branches of the Department. Seven hundred and twenty-four requests were drawn on the Quartermaster-General for the transportation of Government property.

MONEYS RECEIVED FROM VARIOUS SOURCES.

During the year various sums were received from the sale of condemned Government property, card indexes of the Office of Experiment Stations, and from other sources, amounting to \$6,045.38, divided as follows:

Condemned property.....	\$1,360.74
Card indexes.....	155.75
Publications.....	77.99
United States seacoast telegraph line receipts.....	4,450.90
Total.....	6,045.38

REPORT TO CONGRESS.

The detailed report to Congress of the expenditures of the Department for the fiscal year 1894 was transmitted early last fall, several weeks in advance of the date fixed by law.

ESTIMATES TO CONGRESS.

The estimates of appropriations for 1896 were carefully prepared in this office, in accordance with the usual plan of publication and, upon receiving the approval of the honorable Secretary, were transmitted to the United States Treasury in conformity to law, prior to the date prescribed thereby.

STATEMENT OF THE ACCOUNTS.

The accounts of this Department, which are required to be stated to the United States Treasury quarterly, on the 10th day of the month following the end of the quarter, have invariably been rendered in advance of that date. All accounts for the year ending June 30, 1895, have been passed by the auditing officers of the Treasury, and certified as correct, thus showing a clean balance sheet to the year 1895.

CHECK STATEMENT.

The check statements prepared in this office have been carefully compared with, and verified by, the monthly statements furnished by the Treasury and subtreasury at Washington and New York, for each month of this fiscal year. During that period five checks were lost through the mails and otherwise, as against twenty for the year 1894. Of these twenty-five checks, four were received and subsequently lost by the payees.

CONTRACTS FOR SUPPLIES.

Contracts for supplies for the year 1895 were made early in the season, upon very liberal terms to the Department, and included nearly all classes of goods required for its uses during the year. The terms of the contracts were fully complied with in nearly every instance.

The contracts for supplies for the year 1896 have been entered into, secured by a sufficient bond in each case upon still better terms to the Government than those of the previous year.

Through the persistent efforts of this office, the contract system, as contemplated by section 3709, Revised Statutes, is now more fully complied with than at any previous period in the history of the Department.

ACCOUNTS FOR 1892 AND 1893 CLOSED.

All unexpended balances of appropriations for the years 1892 and 1893 were carried to the surplus fund and covered into the United States Treasury on June 29, 1895. This act finally disposes of the accounts of this Department for those years.

REDUCTION OF EXPENSES.

The good results of the economic financial policy that has been faithfully pursued during the present administration of this Department are now clearly evidenced by the large balances remaining to the credit of the appropriations for the last two fiscal years. When the accounts of the year 1894 shall have been finally settled there will be a balance to cover into the United States Treasury of about \$625,000, and of the year 1895 there will remain over \$500,000 after all outstanding liabilities have been liquidated. The unexpended balance for the year 1895 will not be so large as that for the year 1894, for the reasons that the amount of the latter appropriation was \$104,476.94 less than for the previous year; that new work, of a scientific character, was undertaken involving additional outlay of funds; and that a further extension of the functions of the Bureau of Animal Industry was made necessary during the last year, unavoidably increasing the expenditures of that Bureau for the period last named.

Incident to and in line with this financial policy, it is pleasing to note that there has not been a deficiency created by any branch of the Department since the year 1892, notwithstanding that the amounts appropriated in some cases for several minor objects have been hardly sufficient to accomplish the work required to be done. In such cases the closest vigilance must be observed in order that the appropriation be not exceeded.

SALE OF SUGAR MACHINERY.

Early in May, 1895, a board of three persons was appointed by the Secretary for the purpose of locating, identifying, recovering, collecting, appraising, and selling certain sugar machinery, the property of the United States Government, purchased and used by the Department of Agriculture in the series of "experiments in the manufacture of sugar" in several of the Western, Southern, and Eastern States.

The efforts of the board thus appointed were successful so far as locating and identifying the machinery which was classified, scheduled, and freely advertised, and every facility afforded bidders in order to secure competition and the most advantageous terms to the Govern-

ment. Since the above date all such machinery and buildings have been sold, as shown in the following table, for the sum of \$6,504, and that amount has been covered into the United States Treasury on account of "proceeds of Government property," as required by law:

Amounts realized from sale of sugar machinery.

Distilling apparatus at Medicine Lodge, Kans	\$110.00
Machinery, tanks, pumps, etc., at Fort Scott, Kans.....	1,625.00
Machinery, shafting, pulleys, etc., at Lawrence, La.....	348.50
Machinery, implements, pulleys, etc., at Medicine Lodge, Kans.....	1,220.50
Machinery at Audubon Park, New Orleans, La	200.00
Machinery, boilers, engines, etc., at Runnymede, Fla.....	2,300.00
Buildings at Runnymede, Fla.....	100.00
Buildings at Medicine Lodge, Kans.....	100.00
Machinery at Medicine Lodge, Kans.....	500.00
Total	6,504.00

By adding to this amount the several sums received from previous sales, a grand total is shown of \$11,360.02, which represents to the Government what now remains of an original outlay for sugar machinery of \$205,545.35. A recent statement prepared by this office shows that from 1881 to 1895 appropriations were made for conducting sugar experiments amounting in the aggregate to \$675,993.39, including \$3,597.78 from sales of products. Of this sum \$597,672.25 was actually expended for machinery, labor, and a variety of incidental expenses attending the work carried on during the period named.

REGULATIONS AND NEW SCHEDULES.

The regulations governing financial transactions with the Department that went into effect July 1, 1894, have operated very satisfactorily to this office, promoting the general interest of the Department, strengthening certain weak features in the business methods pursued by the several bureaus and divisions, and establishing definite and uniform lines of action in the conduct of all business transacted with this office. The requirements of the regulations seem thoroughly understood and are conformed to, with but little dissenting on the part of those doing business with the Department.

The new forms for schedules for annual supplies that were adopted at the same time with the regulations include the Weather Bureau branch of the Department, which has heretofore maintained an independent schedule. The change was made with a view of simplifying this feature of the contract system, reducing the amount of work, and of obtaining cheaper prices on supplies. The result has been very gratifying and will effect considerable saving in expenses.

In the past it has been the practice of the Department to lease buildings, offices, land, etc., and to enter into agreements, at odd dates during the year, said leases and agreements extending from one year into another. It was arranged by this office that all leases and similar legal documents should terminate with the 30th of June, 1895. New leases, contracts, agreements, and authorizations have been made, dating from July 1, 1895, and hereafter all papers of this character will extend only to the end of each fiscal year, and will be renewed or canceled at that date, unless absolute revocation becomes necessary at an earlier period.

It is pleasing to report that the work of the Division of Accounts and Disbursements is fully up to date, and that the very large volume

of business transacted by the division during the year has been disposed of promptly and with commendable accuracy, to which the reports of the accounting officers of the United States Treasury bear testimony. In this connection I cheerfully and earnestly commend the employees of this division for industry, punctuality, efficiency, and conscientious attention to duty.

Reference was made in the report of this division for the year 1894 to the preparation of a full statement of all amounts appropriated for the maintenance of the United States Department of Agriculture from its inception to the present date. This statement has been carefully prepared and is herewith respectfully submitted with the suggestion that it be made a part of this report. It is as follows:

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture from the fiscal year 1839 to the fiscal year 1894, inclusive.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.		Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.				
Collection of agricultural statistics, etc.	Mar. 3, 1839	5	354	1839	\$1,000.00	\$1,000.00	.....
	Aug. 26, 1842	5	533	1842	1,000.00	1,000.00	.....
	Mar. 3, 1843	5	642	1844	2,000.00	2,000.00	.....
	June 17, 1844	5	687	1845	2,000.00	2,000.00	.....
	Mar. 3, 1845	5	757	1846	3,000.00	3,000.00	.....
	Mar. 3, 1847	9	160	1847	3,000.00	3,000.00	.....
	Aug. 12, 1848	9	285	1848	3,500.00	3,500.00	.....
	do	9	285	1848	1,000.00	1,000.00	.....
	Mar. 3, 1849	9	364	1849	3,500.00	3,500.00	.....
	do	9	364	1850	1,000.00	1,000.00	.....
Chemical analyses of vegetable substances	Sept. 30, 1850	9	541	1850	4,500.00	4,500.00	.....
	Mar. 3, 1851	9	615	1851	5,500.00	5,500.00	.....
	Aug. 31, 1852	10	95	1852	5,000.00	5,000.00	.....
	Mar. 3, 1853	10	208	1853	5,000.00	5,000.00	.....
Collection of agricultural statistics and purchase of seeds	May 31, 1854	10	292	1854	10,000.00	10,000.00	.....
	Aug. 4, 1854	10	567	1855	50,000.00	50,000.00	.....
	Mar. 3, 1855	10	664	1856	30,000.00	30,000.00	.....
	May 15, 1856	11	14	1857	75,000.00	75,000.00	.....
Collection of agricultural statistics, etc., and purchase, etc., of seeds	Aug. 18, 1856	11	89	1858	60,000.00	60,000.00	.....
	Mar. 3, 1857	11	226	1858	3,500.00	3,500.00	.....
	do	11	226	1859	60,000.00	60,000.00	.....
	June 12, 1858	11	321	1860	40,000.00	40,000.00	.....
Information in relation to consumption of cotton.	Mar. 3, 1859	11	427	1860	60,000.00	60,000.00	.....
	June 25, 1860	12	108	1861	60,000.00	60,000.00	.....
	Mar. 2, 1861	12	217	1862	64,000.00	63,704.21	295.79
	Feb. 13, 1862	12	338	1863	80,000.00	80,000.00	.....
Collection of agricultural statistics, etc., and purchase, etc., of seeds, including a deficiency appropriation of \$20,000, made March 3, 1863.	Mar. 1, 1862	12	350	1863	5,000.00	5,000.00	.....
	Feb. 25, 1863	12	691	1864	87,000.00	87,000.00	.....
	do	12	691	1864	3,000.00	3,000.00	.....
	do	12	691	1864	20,000.00	9,500.00	10,500.00
	Mar. 14, 1864	13	23	1864	2,000.00	2,000.00	.....
	do	13	23	1864	800.00	800.00	.....
	do	13	23	1864	1,320.00	1,320.00	.....
	do	13	23	1864	650.00	650.00	.....
	do	13	23	1865	38,300.00	38,300.00	.....
	June 25, 1864	13	155	1865	3,500.00	3,500.00	.....
Contingent expenses.	July 2, 1864	13	350	1865	20,000.00	20,000.00	.....
	June 25, 1864	13	155	1865	800.00	800.00	.....
	do	13	155	1865	800.00	800.00	.....
	do	13	155	1865	4,000.00	4,000.00	.....
Collecting agricultural statistics.	do	13	155	1865	4,000.00	4,000.00	.....
	do	13	155	1865	4,000.00	4,000.00	.....
	do	13	155	1865	4,000.00	4,000.00	.....
	do	13	155	1865	4,000.00	4,000.00	.....
Furniture, carpets, etc.	do	13	155	1865	4,000.00	4,000.00	.....
	do	13	155	1865	4,000.00	4,000.00	.....
	do	13	155	1865	4,000.00	4,000.00	.....
	do	13	155	1865	4,000.00	4,000.00	.....
Library and laboratory.	do	13	155	1865	4,000.00	4,000.00	.....
	do	13	155	1865	4,000.00	4,000.00	.....
	do	13	155	1865	4,000.00	4,000.00	.....
	do	13	155	1865	4,000.00	4,000.00	.....

Purchase and distribution of seeds.....	do.....	13	155	1865	61,000.00	61,000.00	-----
Experimental garden and grounds.....	do.....	13	155	1865	15,800.00	15,800.00	-----
To pay a debt incurred in preparing the Agricultural Report for 1861.....	July 2, 1864	13	350	1865	3,704.05	3,596.55	107.50
Rent, etc., of Commissioner's office.....	July 4, 1864	13	381	1865	3,500.00	3,500.00	-----
Salaries.....	Mar. 2, 1865	{ 13	160	1866	46,726.59	46,726.59	-----
Contingent expenses.....	do.....	{ 13	455	1866	7,500.00	7,500.00	-----
Collecting agricultural statistics.....	do.....	{ 13	455	1866	20,000.00	20,000.00	-----
Purchase, etc., of seeds.....	do.....	{ 13	160	1866	70,165.90	70,165.90	-----
Experimental garden and grounds, etc.....	do.....	{ 13	455	1866	23,395.33	23,395.33	-----
Salaries.....	do.....	{ 13	160	1866	39,600.00	39,600.00	-----
Contingent expenses.....	July 23, 1866	14	201	1867	11,500.00	11,500.00	-----
Collecting agricultural statistics.....	do.....	14	201	1867	10,000.00	10,000.00	-----
Purchase of seeds.....	do.....	{ 14	201	1867	115,200.00	115,200.00	-----
Experimental garden and grounds, etc.....	Mar. 30, 1867	15	28	1867	22,800.00	22,800.00	-----
Salaries.....	do.....	15	292	1868	38,020.00	38,020.00	-----
Contingent expenses.....	Mar. 2, 1867	14	451	1868	13,000.00	13,000.00	-----
Collecting agricultural statistics.....	do.....	14	451	1868	10,000.00	8,406.34	1,593.66
Purchase, etc., of seeds.....	do.....	14	452	1868	85,200.00	85,200.00	-----
Museum.....	do.....	14	452	1868	10,000.00	10,000.00	-----
Experimental garden and grounds.....	do.....	14	452	1868	22,800.00	22,800.00	-----
To erect a building for the Department of Agriculture.....	do.....	14	464	1868	100,000.00	99,668.00	332.00
For certain goods and services furnished the Department.....	do.....	14	464	1868	37,604.70	37,604.70	-----
Salaries.....	July 13, 1868	15	90	1869	65,368.00	65,368.00	-----
Collecting agricultural statistics.....	do.....	15	105	1869	10,000.00	10,000.00	-----
Contingent expenses.....	do.....	15	106	1869	31,090.00	31,090.00	-----
Experimental garden and grounds.....	do.....	15	106	1869	23,500.00	23,500.00	-----
Purchase, etc., of seeds.....	do.....	15	106	1869	20,000.00	20,000.00	-----
Furniture, cases, and repairs.....	do.....	15	106	1869	22,635.00	22,635.00	-----
Salaries.....	Mar. 3, 1869	{ 15	297	1870	60,240.00	67,720.00	1,520.00
Collecting agricultural statistics.....	do.....	{ 15	298	1870	15,000.00	15,000.00	-----
Investigations of cattle disease.....	do.....	15	298	1870	15,000.00	12,695.60	2,304.40
Contingent expenses.....	do.....	15	298	1870	13,200.00	13,200.00	-----
Furniture, cases, and repairs.....	do.....	15	298	1870	2,500.00	2,500.00	-----
Experimental garden and grounds.....	do.....	15	298	1870	21,500.00	21,500.00	-----
Purchase, etc., of seeds.....	do.....	15	298	1870	20,000.00	18,981.33	1,018.67
Salaries.....	July 12, 1870	16	245	1871	71,980.00	71,811.64	168.36
Collecting agricultural statistics.....	do.....	16	314	1871	15,000.00	15,000.00	-----
Purchase, etc., of seeds.....	July 15, 1870	16	245	1871	30,000.00	28,865.17	1,134.83
Experimental garden and grounds.....	do.....	16	246	1871	53,200.00	53,200.00	-----
Contingent expenses.....	do.....	16	302	1871	8,100.00	8,100.00	-----
Furniture, cases, and repairs.....	July 12, 1870	16	246	1871	4,700.00	4,700.00	-----
Collecting and modeling specimens of fruit.....	do.....	16	246	1871	1,000.00	1,000.00	-----
Library.....	do.....	16	246	1871	1,000.00	1,000.00	-----

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.		Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
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Herbarium.....	July 12, 1870	16	246	1871	\$1,000.00	\$1,000.00	-----
Laboratory.....	do.....	16	246	1871	1,700.00	1,700.00	-----
Folding room.....	do.....	16	246	1871	500.00	500.00	-----
Salaries.....	Mar. 3, 1871	16	489	1872	75,170.00	75,017.89	\$152.11
Collecting agricultural statistics.....	do.....	16	489	1872	15,000.00	14,053.36	940.64
Purchase and distribution of seeds, etc.....	do.....	16	489	1872	45,000.00	45,000.00	-----
Experimental garden and grounds.....	do.....	16	489	1872	36,800.00	36,800.00	-----
Contingent expenses.....	do.....	16	509	1872	12,900.00	12,900.00	-----
Furniture, cases, and repairs.....	do.....	16	490	1872	4,700.00	4,700.00	-----
Collecting and modeling specimens of fruit.....	do.....	16	490	1872	1,000.00	1,000.00	-----
Herbarium.....	do.....	16	490	1872	1,000.00	1,000.00	-----
Library.....	do.....	16	490	1872	2,050.00	2,050.00	-----
Laboratory.....	do.....	16	490	1872	3,450.00	3,450.00	-----
Salaries.....	May 8, 1872	17	77	1873	75,880.00	75,889.73	27
Collecting agricultural statistics.....	do.....	17	77	1873	15,000.00	15,000.00	-----
Purchase and distribution of seeds.....	do.....	17	77	1873	55,000.00	55,000.00	-----
Experimental garden and grounds.....	do.....	17	77	1873	31,000.00	31,000.00	-----
Contingent expenses.....	June 10, 1872	17	368	1873	13,300.00	12,507.06	792.94
Folding room.....	do.....	17	77	1873	300.00	300.00	-----
Furniture, cases, and repairs.....	do.....	17	77	1873	5,200.00	5,200.00	-----
Museum and herbarium.....	do.....	17	78	1873	5,000.00	4,674.43	325.57
Library.....	June 10, 1872	17	369	1873	1,750.00	1,750.00	-----
Salaries.....	May 8, 1872	17	78	1874	78,100.00	76,924.00	1,266.00
Collecting agricultural statistics.....	Mar. 3, 1873	17	506	1874	15,000.00	11,553.20	3,446.80
Purchase and distribution of seeds, etc.....	do.....	17	506	1874	65,000.00	64,904.89	95.11
Experimental garden and grounds.....	do.....	17	507	1874	26,200.00	25,731.74	468.26
Museum and herbarium.....	do.....	17	507	1874	2,000.00	1,942.02	57.98
Contingent expenses.....	do.....	17	507	1874	13,600.00	12,699.34	900.66
Furniture, cases, and repairs.....	do.....	17	507	1874	4,200.00	3,392.40	897.60
Library.....	do.....	17	507	1874	1,500.00	1,259.10	240.90
Postage.....	do.....	17	542	1874	52,000.00	35,449.09	16,550.91
Salaries.....	do.....	18	107	1875	77,180.00	77,127.60	52.40
Collecting agricultural statistics.....	June 20, 1874	18	107	1875	15,000.00	12,147.56	2,852.44

Purchase and distribution of seeds, etc.	18	107	1875	95,000.00	94,719.83	280.17
Furniture, cases, and repairs.	18	303	1875	4,200.00	4,135.36	64.64
Experimental garden and grounds.	18	107	1875	24,100.00	24,094.06	5.94
Contingent expenses.	18	227	1875	12,600.00	10,972.61	1,627.39
Museum and herbarium.	18	107	1875	4,500.00	3,300.00	1,200.00
Laboratory.	18	227	1875	1,300.00	1,300.00	
Postage.	18	227	1875	1,500.00	1,087.90	412.10
To publish Commissioner's report for the years 1872 and 1873.	18	107	1875	52,000.00	42,633.00	9,367.00
Salaries.	18	227	1875	50,000.00	49,561.91	438.09
Collecting agricultural statistics.	18	368	1876	77,180.00	77,115.71	64.29
Purchase and distribution of seeds.	18	368	1876	15,000.00	14,500.00	500.00
Experimental garden and grounds.	18	368	1876	65,000.00	65,000.00	
Museum and herbarium.	18	368	1876	19,990.00	19,956.11	33.89
Furniture, cases, and repairs.	18	368	1876	2,000.00	1,993.55	6.45
Laboratory.	18	368	1876	3,300.00	3,124.23	175.77
Contingent expenses.	18	368	1876	1,250.00	1,046.84	203.16
Postage.	18	368	1876	1,300.00	1,300.00	
Salaries.	18	368	1876	12,100.00	11,378.91	721.09
Experimental garden and grounds.	18	95	1876	52,000.00	3,428.29	48,571.71
Collecting agricultural statistics.	18	167	1877	67,836.96	67,806.19	30.77
Purchase and distribution of seeds, etc.	18	115	1877	11,550.00	11,550.00	
Museum and herbarium.	18	167	1877	10,000.00	10,000.00	
Furniture, cases, and repairs.	18	167	1877	85,000.00	80,000.00	5,000.00
Laboratory.	18	167	1877	2,000.00	2,000.00	
Contingent expenses.	18	167	1877	2,000.00	2,000.00	
Postage.	18	167	1877	1,000.00	800.00	200.00
Salaries.	18	167	1877	1,300.00	1,300.00	
Collecting agricultural statistics.	18	167	1877	10,000.00	8,800.00	1,200.00
Purchase and distribution of seeds, etc.	18	167	1877	4,000.00	2,950.00	50.00
Experimental garden and grounds.	18	317	1878	65,640.00	65,640.00	
Museum.	18	317	1878	15,000.00	15,000.00	
Furniture, cases, and repairs.	18	317	1878	75,000.00	74,579.33	420.67
Laboratory.	18	317	1878	10,500.00	10,500.00	
Contingent expenses.	18	360	1878	1,500.00	1,500.00	
Postage.	18	317	1878	4,500.00	4,500.00	
Report on forestry.	18	317	1878	1,000.00	1,000.00	
International Industrial Exposition at Paris.	18	317	1878	8,000.00	8,000.00	
Salaries.	18	317	1878	4,000.00	3,415.61	584.39
Collecting agricultural statistics.	18	360	1878	2,500.00	2,500.00	
Purchase and distribution of seeds, etc.	18	246	1878	10,000.00	10,000.00	
Experimental garden and grounds.	18	203	1879	66,900.00	66,900.00	
Museum.	18	203	1879	10,000.00	10,000.00	
Furniture, cases, and repairs.	18	203	1879	75,000.00	75,000.00	
Laboratory.	18	203	1879			
Contingent expenses.	18	203	1879			
Postage.	18	203	1879			
Report on forestry.	18	203	1879			
International Industrial Exposition at Paris.	18	203	1879			
Salaries.	18	203	1879			
Collecting agricultural statistics.	18	203	1879			
Purchase and distribution of seeds, etc.	18	203	1879			

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.		Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
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Experimental garden and grounds.....	June 19, 1878	{ 20	293	} 1879	\$13,500.00	\$13,500.00	-----
Museum.....	do	20	240		1,000.00	1,000.00	-----
Furniture, cases, and repairs.....	do	20	203	1879	4,000.00	4,000.00	-----
Library.....	do	20	204	1879	1,000.00	1,000.00	-----
Laboratory.....	do	20	204	1879	1,500.00	1,500.00	-----
Contingent expenses.....	do	20	204	1879	8,000.00	8,000.00	-----
Postage.....	do	20	204	1879	4,000.00	3,960.00	\$40.00
Investigating the history and habits of insects.....	do	20	204	1879	10,000.00	10,000.00	-----
Investigating diseases of domestic animals.....	do	20	240	1879	10,000.00	10,000.00	-----
To erect a stable.....	do	20	240	1879	1,500.00	1,500.00	-----
Salaries.....	Mar. 3, 1879	20	392	1879	66,900.00	66,900.00	-----
Collecting agricultural statistics.....	do	21	23	1880	10,000.00	9,982.88	17.12
Purchase and distribution of seeds, etc.....	do	21	23	1880	75,000.00	75,000.00	-----
Experimental garden and grounds.....	do	21	23	1880	13,100.00	13,100.00	-----
Museum.....	do	21	23	1880	1,000.00	1,000.00	-----
Furniture, cases, and repairs.....	do	21	23	1880	4,000.00	4,000.00	-----
Laboratory.....	do	21	23	1880	1,000.00	1,000.00	-----
Contingent expenses.....	do	21	23	1880	1,500.00	1,500.00	-----
Postage.....	do	21	23	1880	8,000.00	8,000.00	-----
Investigating the history and habits of insects.....	do	21	23	1880	4,000.00	4,000.00	-----
Investigating diseases of domestic animals.....	do	21	30	1880	5,000.00	5,000.00	-----
Salaries.....	do	21	30	1880	10,000.00	8,878.84	1,121.16
Purchase and distribution of seeds, etc.....	do	21	292	1881	69,200.00	69,185.22	14.78
Collecting agricultural statistics.....	do	21	294	} 1881	102,160.31	102,157.48	2.83
Experimental garden and grounds.....	do	21	453		9,985.60	9,985.60	14.40
Museum.....	May 3, 1881	21	293	1881	12,600.00	12,600.00	-----
Furniture, cases, and repairs.....	do	21	294	1881	1,000.00	1,000.00	-----
Laboratory.....	do	21	294	1881	5,000.00	5,000.00	-----
Contingent expenses.....	do	21	294	1881	1,000.00	1,000.00	-----
Postage.....	do	21	295	1881	4,000.00	4,000.00	-----
Report on forestry.....	do	21	295	1881	10,000.00	9,769.17	230.83
Investigating the history and habits of insects.....	do	21	296	1881	4,000.00	3,838.00	162.00
Investigating diseases of domestic animals.....	do	21	296	1881	5,000.00	3,762.51	1,237.49
Examination of fibers.....	do	21	295	1881	5,000.00	4,997.31	2.69
Experiments in the manufacture of sugar.....	do	21	295	1881	10,000.00	10,000.00	-----
Collecting data touching arid regions of the United States.....	do	21	295	1881	7,500.00	7,500.00	-----
Reclamation of arid lands.....	do	21	295	1881	5,000.00	4,460.00	4,540.00
Salaries.....	do	21	295	1881	20,000.00	18,353.55	(¹)
Salaries.....	Mar. 3, 1881	21	381	1882	79,500.00	79,491.81	8.19

Collecting agricultural statistics.....	do.....	21	382	1	1882	10,000.00	10,000.00	188.15
Laboratory.....	do.....	21	382	1	1882	6,000.00	5,811.85	188.15
Purchase and distribution of seeds, etc.....	do.....	21	382	1	1882	100,000.00	99,991.53	8.47
Experiments in the culture, etc., of tea.....	do.....	22	44	1	1882	10,000.00	8,750.87	1,249.13
Experimental garden and grounds.....	do.....	21	383	1	1882	15,000.00	14,968.25	31.75
Museum.....	do.....	21	383	1	1882	1,000.00	1,000.00	
Furniture, cases, and repairs.....	do.....	21	383	1	1882	4,000.00	4,000.00	
Library.....	do.....	21	383	1	1882	1,000.00	973.85	26.15
Investigating the history and habits of insects.....	do.....	21	383	1	1882	20,000.00	19,998.94	1.06
Examination of fibers.....	do.....	21	384	1	1882	5,000.00	5,000.00	
Investigating the diseases of domestic animals.....	do.....	21	384	1	1882	25,000.00	22,443.89	2,556.11
Collecting data touching the arid regions of the United States.....	do.....	21	384	1	1882	5,000.00	4,216.55	783.45
Reclamation of arid lands, including an unexpended balance of \$1,646.45 from fiscal year 1881.....	do.....	21	384	1	1882	11,646.45	11,561.19	(¹)
Report on forestry.....	do.....	21	384	1	1882	5,000.00	4,941.00	59.00
Postage.....	do.....	21	384	1	1882	4,000.00	4,000.00	
Contingent expenses.....	do.....	21	384	1	1882	10,000.00	10,000.00	
Building for display of agricultural implements.....	do.....	21	384	1	1882	10,000.00	10,000.00	
Experiments in the manufacture of sugar (including \$861.60 from sale of molasses, etc.).....	do.....	21	385	1	1882	35,864.60	32,333.75	(²)
Transportation of specimens from Atlanta.....	do.....	22	3	1	1882	4,998.91	4,998.91	1.09
Salaries.....	do.....	22	3	1	1882	102,575.49	102,575.49	4.51
Collecting agricultural statistics.....	do.....	22	89	1	1883	80,000.00	78,170.80	1,829.20
Laboratory.....	do.....	22	90	1	1883	6,000.00	6,000.00	
Purchase and distribution of seeds, etc.....	do.....	22	90	1	1883	80,000.00	80,000.00	
Experiments in the culture, etc., of tea.....	do.....	22	91	1	1883	5,000.00	3,905.68	1,094.34
Experimental garden and grounds.....	do.....	22	91	1	1883	15,500.00	15,471.82	28.18
Museum.....	do.....	22	92	1	1883	1,000.00	1,000.00	
Furniture, cases, and repairs.....	do.....	22	91	1	1883	6,700.00	6,700.00	
Library.....	do.....	22	91	1	1883	1,485.32	1,485.32	14.68
Investigating the history and habits of insects.....	do.....	22	91	1	1883	20,000.00	19,997.75	2.25
Examination of fibers.....	do.....	22	91	1	1883	10,000.00	7,961.94	2,038.06
Investigating the diseases of domestic animals.....	do.....	22	91	1	1883	25,000.00	21,584.28	3,415.72
Reclamation of arid lands, including an unexpended balance of \$85.26 from fiscal year 1882.....	do.....	22	92	1	1883	20,085.26	12,429.13	(³)
Report on forestry.....	do.....	22	92	1	1883	10,000.00	8,731.99	1,268.01
Postage.....	do.....	22	92	1	1883	4,000.00	3,977.49	22.51
Contingent expenses.....	do.....	22	92	1	1883	15,000.00	14,920.74	79.26
Experiments in the manufacture of sugar, including an unexpended balance of \$3,530.85 from fiscal year 1882.....	do.....	22	92	1	1883	28,530.85	28,529.31	1.54
Precision of building for seed division.....	do.....	22	306	1	1883	25,000.00	25,000.00	
Report on the Angora goat.....	do.....	22	337	1	1883	500.00	500.00	
Salaries.....	do.....	22	408	1	1884	127,640.00	127,639.87	13
Collecting agricultural statistics.....	do.....	22	410	1	1884	80,000.00	79,770.86	229.14
Laboratory, and for experiments in the manufacture of sugar, including \$842.18 from the sale of sirup, etc.....	do.....	22	410	1	1884	16,842.18	16,829.26	12.92
Purchase and distribution of seeds, etc.....	do.....	22	410	1	1884	75,000.00	74,986.48	13.52

³ Unexpended balance of \$3,530.85 carried to fiscal year 1883.

¹ Unexpended balance of \$1,646.45 carried to fiscal year 1882.

² Unexpended balance of \$85.26 carried to fiscal year 1883.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.		Fiscal year.	Amount printed.	Amount disbursed.	Amount unexpended.
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Experimental garden and grounds	Jan. 20, 1883	22	409	1884	\$15,500.00	\$15,448.87	\$51.13
Museum	do	22	411		1,000.00	993.51	6.49
Furniture, cases, and repairs	do	22	409		6,000.00	5,988.82	1.18
Library	do	22	410	1884	1,500.00	1,439.86	60.14
Investigating the history and habits of insects	do	22	411		20,002.82	20,002.82	—
Reclamation of arid lands, including an unexpended balance of \$7,656.13 from fiscal year 1883	do	22	409		—	—	—
Report on forestry	Aug. 4, 1886	24	273	1884	17,658.13	16,164.68	1,491.45
Postage	Jan. 20, 1883	22	411		25,000.00	24,011.83	988.15
Contingent expenses	do	22	411		10,000.00	9,998.30	1.70
Building of greenhouse	do	22	411	1884	4,000.00	3,841.48	158.52
Salaries	do	22	411		14,000.00	13,991.43	8.57
Collecting agricultural statistics	do	22	411		2,500.00	2,500.00	—
Bureau of Animal Industry	June 5, 1884	23	36	1885	137,590.00	137,557.80	32.20
Purchase and distribution of seeds, etc.	do	23	38		100,000.00	99,986.59	13.41
Laboratory, and for experiments in the manufacture of sugar	May 29, 1884	23	31		1885	56,807.73	(1)
Investigating the history and habits of insects	June 5, 1884	23	38	1885	100,000.00	99,983.82	16.18
Silk culture	do	23	38		50,000.00	49,996.70	3.30
Contingent expenses	do	23	37		20,000.00	19,986.83	13.17
Report on forestry	do	23	39	1885	15,000.00	14,916.23	83.77
Experimental garden and grounds	do	23	39		15,000.00	14,862.20	137.80
Furniture, cases, and repairs	do	23	39		10,000.00	9,987.36	12.64
Postage	do	23	37	1885	17,840.25	17,513.67	326.58
Experiments in the culture, etc., of tea	do	23	581		6,000.00	5,947.27	52.73
Library	do	23	38		4,000.00	3,956.98	43.02
Museum	Oct. 19, 1888	23	39	1885	3,000.00	2,998.90	1.10
Quarantine stations	June 5, 1884	23	39		1,500.00	1,403.63	96.37
Salaries	do	23	39		1,000.00	1,000.00	—
Collecting agricultural statistics	do	23	37	1885	25,000.00	22,029.18	(2)
Bureau of Animal Industry, including an unexpended balance of \$93,192.27 from fiscal year 1885	do	23	207		137,590.00	137,337.42	252.58
Quarantine stations, including an unexpended balance of \$2,970.82 from fiscal year 1885	Mar. 3, 1885	23	353		75,000.00	68,737.06	6,276.94
Purchase and distribution of seeds, etc.	do	23	355	1886	193,192.27	58,261.05	134,931.22
Laboratory, and for experiments in the manufacture of sugar	do	23	356		32,970.82	18,938.57	14,032.25
Investigating the history and habits of insects	do	23	354		100,000.00	99,986.24	19.76
Silk culture	do	23	354	1886	40,000.00	39,942.11	57.89
Contingent expenses	do	23	354		25,000.00	24,976.46	23.54
Report on forestry	do	23	356		15,012.00	15,008.50	3.50
Experimental garden and grounds	Oct. 19, 1888	25	581	1886	15,000.00	14,937.62	62.38
Furniture, cases, and repairs	Mar. 3, 1885	23	356		10,000.00	9,836.83	163.17
Postage	do	23	356		—	—	—

Experimental garden and grounds.....	23	do	254	1	1886	17, 208.13	17, 024.88	183.25
Furniture, cases, and repairs.....	24	Aug. 4, 1886	273	1	1886	7, 500.00	7, 423.59	76.41
Postage.....	25	Oct. 19, 1888	581	1	1886	2, 556.20	2, 556.20	1, 443.80
Experiments in the culture, etc., of tea.	23	Mar. 3, 1885	354	1	1886	3, 000.00	1, 813.67	1, 386.33
Library.....	23	do	356	1	1886	1, 500.00	1, 417.03	82.97
Museum.....	23	do	355	1	1886	1, 000.00	998.88	1.12
Salaries.....	23	do	354	1	1886	142, 890.00	141, 420.62	1, 469.32
Collecting agricultural statistics.....	24	June 30, 1886	100	1	1887	65, 000.00	64, 955.14	44.86
Bureau of Animal Industry.....	24	do	103	1	1887	100, 000.00	99, 985.56	14.44
Quarantine stations.....	24	do	103	1	1887	30, 000.00	10, 639.44	19, 360.56
Purchase and distribution of seeds, etc.....	24	do	102	1	1887	100, 000.00	99, 998.37	1.63
Laboratory.....	24	do	101	1	1887	6, 000.00	4, 570.86	1, 429.14
Experiments in the manufacture of sugar, including \$1,891 from sales.	24	do	101	1	1887	95, 891.00	95, 853.14	37.86
Investigating the history and habits of insects.....	24	do	101	1	1887	15, 096.25	15, 088.05	8.20
Silk culture, including \$864.81 from sale of raw silk.....	24	Oct. 19, 1888	582	1	1887	15, 939.56	15, 939.56	
Contingent expenses.....	25	June 30, 1886	101	1	1887	15, 000.00	14, 936.83	63.17
Report on forestry.....	24	do	103	1	1887	8, 000.00	7, 953.50	46.50
Experimental garden and grounds.....	24	do	104	1	1887	23, 200.00	22, 202.15	997.85
Furniture, cases, and repairs.....	24	do	102	1	1887	8, 125.00	8, 092.11	32.89
Postage.....	24	do	103	1	1887	4, 000.00	3, 500.00	500.00
Experiments in the culture, etc., of tea.....	24	do	104	1	1887	2, 000.00	1, 733.78	246.22
Pomological information.....	24	do	100	1	1887	3, 000.00	2, 993.20	6.80
Library.....	24	do	103	1	1887	1, 500.00	1, 428.65	71.35
Botanical investigations.....	24	do	100	1	1887	5, 000.00	4, 988.12	11.88
Museum.....	24	do	102	1	1887	1, 000.00	998.88	1.12
Ornithology and mammalogy.....	24	do	101	1	1887	10, 000.00	9, 990.98	.02
Reclamation of arid lands.....	24	do	103	1	1887	5, 000.00		5, 000.00
Acclimation of food.....	24	do	100	1	1887	1, 000.00	989.14	10.86
Salaries.....	24	Mar. 3, 1887	495	1	1888	161, 490.00	158, 220.87	3, 269.13
Collecting agricultural statistics.....	24	do	498	1	1888	65, 000.00	64, 965.33	34.67
Bureau of Animal Industry, including \$100,000 immediately available.	24	do	499	1	1888	500, 000.00	499, 975.32	24.68
Quarantine stations.....	24	do	499	1	1888	20, 000.00	9, 538.75	10, 461.25
Purchase and distribution of seeds, etc.....	24	do	498	1	1888	103, 000.00	102, 587.55	412.45
Laboratory.....	24	do	497	1	1888	6, 000.00	5, 969.89	30.11
Experiments in the manufacture of sugar.....	24	do	497	1	1888	50, 000.00	49, 997.43	2.57
Experiments in the manufacture of sugar (deficiency).....	25	Oct. 19, 1888	582	1	1887	8, 000.00	7, 927.50	72.50
Investigating the history and habits of insects.....	24	Mar. 3, 1887	497	1	1888	20, 000.00	20, 000.00	
Silk culture, including \$1,989.06 from sale of raw silk.....	24	do	497	1	1888	16, 989.06	16, 989.02	.04
Contingent expenses.....	24	do	499	1	1888	15, 000.00	14, 825.57	174.43
Report on forestry.....	24	do	499	1	1888	8, 000.00	7, 996.10	3.90
Experimental garden and grounds.....	24	do	497	1	1888	24, 800.00	24, 706.86	93.14
Furniture, cases, and repairs.....	24	do	498	1	1888	7, 000.00	6, 982.88	17.12
Postage.....	24	do	499	1	1888	4, 000.00	3, 900.00	1, 000.00
Pomological information.....	24	do	497	1	1888	3, 000.00	2, 971.69	28.31
Library.....	24	do	499	1	1888	2, 000.00	1, 983.78	16.22

¹ Unexpended balance of \$93,192.27 carried to fiscal year 1886.

² Unexpended balance of \$2,970.82 carried to fiscal year 1886.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Botanical investigations.....	Mar. 3, 1887	24	496	1	1888	\$7,000.00	\$6,997.28	\$2.72
Museum.....	do	24	497	1	1888	1,000.00	947.41	52.59
Ornithology and mammalogy.....	do	24	497	1	1888	3,940.00	3,869.23	70.77
Adulteration of food.....	do	24	497	1	1888	1,000.00	830.16	169.84
Salaries.....	July 18, 1888	25	328	1	1889	171,890.32	169,152.51	2,737.81
Collecting agricultural statistics.....	Mar. 2, 1889	25	923	1	1889	70,000.00	69,162.45	837.55
Botanical investigations.....	July 18, 1888	25	332	1	1889	35,000.00	22,076.75	(1)
Investigating the history and habits of insects.....	do	25	330	1	1889			
	do	25	331	1	1889	20,131.64	20,131.64	
	Sept. 30, 1890	26	325	1				
	July 18, 1888	25	332	1	1889	5,025.90	5,022.06	3.84
Ornithology and mammalogy.....	Mar. 2, 1889	25	838	1	1889			
	Sept. 30, 1890	26	525	1				
	Mar. 3, 1891	26	880	1				
Pomological information.....	July 18, 1888	25	330	1	1889	4,024.48	4,020.22	4.16
Microscopical investigations.....	do	25	330	1	1889	1,000.00	999.87	.13
Laboratory.....	do	25	330	1	1889	11,000.00	9,994.25	1,005.75
Forestry investigations.....	Mar. 2, 1889	25	837	1	1889	8,000.00	7,999.03	.97
Purchase and distribution of seeds.....	July 18, 1888	25	333	1	1889	104,200.00	104,168.73	31.27
Experimental gardens and grounds.....	do	25	332	1	1889	26,640.00	26,639.83	.17
Museum.....	do	25	332	1	1889	1,000.00		108.75
Furniture, cases, and repairs.....	do	25	333	1	1889	7,350.00	7,236.74	113.26
Library.....	do	25	333	1	1889	2,000.00	1,956.34	43.66
Postage.....	do	25	333	1	1889	4,000.00	4,000.00	
Contingent expenses.....	do	25	333	1	1889	15,010.00	15,009.22	.78
Office of Experiment Stations.....	Mar. 3, 1891	26	881	1	1889	10,000.00	9,033.77	966.23
Experiments in the manufacture of sugar.....	July 18, 1888	25	334	1	1889	100,000.00	41,635.24	(2)
Quarantine stations.....	do	25	333	1	1889	15,000.00	11,628.39	3,371.61
Bureau of Animal Industry.....	do	25	333	1	1889	500,000.00	479,623.57	20,376.43
Silk culture, including \$708.26 from sale of raw silk.....	do	25	331	1	1889	23,208.26	23,208.26	
Salaries.....	do	25	331	1	1890	178,580.00	175,547.04	3,032.96
Collecting agricultural statistics.....	Mar. 2, 1889	25	825	1	1890	75,000.00	74,327.51	672.49
	do	25	829	1				
	do	25	830	1	1890	48,009.25	47,990.38	18.87
Botanical investigations, including an unexpended balance of \$12,923.25 from fiscal year 1889.....	July 28, 1892	27	296	1	1890	20,000.00	19,892.72	107.28
Investigating the history and habits of insects.....	Mar. 2, 1889	25	837	1	1890			
	do	25	838	1	1890	7,000.00	6,994.16	5.84
Ornithology and mammalogy.....	July 14, 1890	26	285	1	1890			

Pomological information.....	{	Mar. 2, 1889	25	837	1	{	1890	4, 304.79	4, 304.79	
Microscopical investigations.....	{	Mar. 3, 1891	26	881	1	{	1890			
Laboratory.....	{	Mar. 2, 1889	25	837	1	{	1890	1, 062.50	1, 062.50	
Forestry investigations.....	{	July 28, 1892	27	296	1	{	1890	6, 000.00	5, 461.99	518.01
Purchase and distribution of seeds.....	{	Mar. 2, 1889	25	837	1	{	1890	8, 000.00	7, 999.96	0.04
Experimental garden and grounds.....	{	do	25	839	1	{	1890	104, 200.00	104, 174.55	25.45
Museum.....	{	do	25	838	1	{	1890	26, 640.00	26, 478.45	161.55
Furniture, cases, and repairs.....	{	do	25	838	1	{	1890	1, 000.00	998.39	1.61
Library.....	{	do	25	839	1	{	1890	9, 350.00	9, 261.93	88.07
Postage.....	{	Apr. 4, 1890	26	42	1	{	1890	2, 000.00	1, 738.28	261.72
Contingent expenses.....	{	Mar. 2, 1889	25	840	1	{	1890	4, 000.00	4, 000.00	
Office of Experiment Stations.....	{	do	25	840	1	{	1890	20, 000.00	19, 965.32	34.68
Experiments in the manufacture of sugar, including an unexpended balance of \$58,364.76 from fiscal year 1889.....	{	Apr. 4, 1890	26	42	1	{	1890	15, 000.00	14, 991.69	8.31
Quarantine stations.....	{	do	25	840	1	{	1890	83, 364.76	83, 064.14	300.62
Bureau of Animal Industry.....	{	do	25	840	1	{	1890	15, 000.00	11, 266.24	3, 733.76
Silk culture, including \$1,627.81 from sale of raw silk.....	{	do	25	839	1	{	1890	500, 000.00	311, 025.31	(3)
Artesian wells.....	{	do	25	837	1	{	1890	21, 627.81	21, 626.10	1.71
Salaries.....	{	Apr. 4, 1890	26	42	1	{	1890	20, 000.00	19, 652.17	347.83
Collecting agricultural statistics.....	{	July 14, 1890	26	282	1	{	1891	248, 902.55	230, 923.29	8, 979.56
Botanical investigations.....	{	do	26	284	1	{	1891	100, 000.00	85, 126.44	14, 873.56
Investigating the history and habits of insects.....	{	do	26	284	1	{	1891	40, 000.00	36, 428.36	3, 571.61
Ornithology and mammalogy.....	{	do	27	296	1	{	1891	27, 501.77	27, 481.00	20.77
Pomological information.....	{	July 28, 1892	27	296	1	{	1891	14, 004.90	13, 003.67	1, 001.23
Microscopical investigations.....	{	do	26	285	1	{	1891	5, 000.00	4, 983.88	16.12
Vegetable pathology.....	{	do	26	285	1	{	1891	5, 000.00	3, 281.50	1, 718.10
Laboratory.....	{	do	26	285	1	{	1891	15, 000.00	14, 995.75	4.25
Forestry investigations.....	{	do	26	286	1	{	1891	20, 200.00	19, 985.27	214.73
Illustrations and engravings.....	{	do	26	286	1	{	1891	10, 000.00	9, 785.99	214.01
Purchase and distribution of seeds.....	{	do	26	286	1	{	1891	2, 000.00	1, 999.58	.42
Document and folding room.....	{	do	26	286	1	{	1891	105, 400.00	105, 090.94	309.06
Experimental garden and grounds.....	{	do	26	287	1	{	1891	2, 000.00	1, 905.53	4.47
Museum.....	{	do	26	287	1	{	1891	28, 500.00	28, 396.41	103.59
Furniture, cases, and repairs.....	{	do	26	287	1	{	1891	4, 000.00	3, 832.28	167.72
Library.....	{	do	26	287	1	{	1891	12, 000.00	11, 991.01	8.99
Postage.....	{	Mar. 3, 1891	26	1049	1	{	1891	3, 000.00	2, 997.20	2.80
Contingent expenses.....	{	July 14, 1890	26	287	1	{	1891	5, 000.00	4, 833.00	167.00
Office of Experiment Stations.....	{	do	26	287	1	{	1891	20, 000.00	18, 097.15	1, 902.87
Experiments in the manufacture of sugar.....	{	do	26	288	1	{	1891	15, 000.00	14, 984.48	15.52
Irrigation investigations.....	{	do	26	288	1	{	1891	75, 000.00	74, 901.18	98.82
Quarantine stations.....	{	Mar. 3, 1891	26	1050	1	{	1891	40, 000.00	39, 926.67	73.33
	{	Sept. 30, 1890	26	525	1	{	1891	15, 000.00	13, 586.72	1, 413.28
	{	July 14, 1890	26	288	1	{	1891			

Unexpended balance of \$12,923.25 carried to fiscal year 1890.

³ Unexpended balance of \$188,974.69 carried to fiscal year 1891.

— Expended balance of \$26,004.10 carried to fiscal year 1890, and to fiscal year 1891.

Statement of appropriations, disbursements, and unexpended balances for the United States Department of Agriculture, etc.—Continued.

Purpose.	Date of appropriation act.	Reference to Statutes at Large.			Fiscal year.	Amount appropriated.	Amount disbursed.	Amount unexpended.
		Vol.	Page.	Sec.				
Bureau of Animal Industry, including an unexpended balance of \$188,974.69 from fiscal year 1890.	July 14, 1890	26	287	1	1891	\$538,974.69	\$469,113.35	\$69,861.34
Silk culture, including \$565 from sale of raw silk.	do	26	285	1	1891	20,565.00	19,636.33	1,028.67
Salaries.	Mar. 3, 1891	26	1045	1	1892	256,800.00	252,766.17	4,033.83
Collecting agricultural statistics.	do	26	1046	1	1892	102,500.00	88,869.51	13,630.49
Botanical investigations.	do	26	1046	1	1892	40,246.40	40,246.40	
Investigating the history and habits of insects.	Aug. 23, 1894	28	440	1	1892	27,800.00	27,800.00	19.97
Ornithology and mammalogy.	Mar. 3, 1891	26	1047	1	1892	15,000.00	14,688.00	312.00
Pomological information.	do	26	1047	1	1892	3,000.00	4,985.27	14.73
Microscopical investigations.	do	26	1047	1	1892	2,000.00	1,251.46	748.54
Vegetable pathology.	do	26	1047	1	1892	15,076.47	15,076.47	
Laboratory.	Aug. 23, 1894	28	440	1	1892	19,400.00	19,272.59	127.41
Fiber investigations.	Mar. 3, 1891	26	1048	1	1892	10,000.00	8,017.44	1,982.56
Forestry investigations.	do	26	1048	1	1892	15,056.85	15,056.85	
Illustrations and engravings.	Mar. 3, 1893	27	660	1	1892	2,000.00	1,999.85	15
Purchase and distribution of seeds.	Mar. 3, 1891	26	1048	1	1892	105,400.00	104,920.35	479.65
Document and folding room.	do	26	1049	1	1892	2,000.00	1,996.82	3.18
Experimental garden and grounds.	do	26	1049	1	1892	28,622.53	28,536.67	85.86
Museum.	Mar. 3, 1893	27	660	1	1892	4,000.00	3,909.17	90.83
Furniture, cases, and repairs.	Mar. 3, 1891	26	1049	1	1892	10,000.00	9,996.55	3.45
Library.	do	26	1049	1	1892	3,000.00	2,807.75	192.25
Postage.	do	26	1049	1	1892	5,000.00	4,900.00	100.00
Contingent expenses.	do	26	1049	1	1892	25,000.00	24,762.32	237.68
Office of Experiment Stations.	do	26	1050	1	1892	20,000.00	19,989.47	10.53
Experiments in the manufacture of sugar.	do	26	1050	1	1892	35,000.00	34,627.78	372.22
Quarantine stations.	Mar. 18, 1892	27	7	1	1892	15,000.00	14,983.63	16.37
Bureau of Animal Industry.	Mar. 3, 1891	26	1045	1	1892	650,000.00	649,980.91	19.09
Weather Bureau.	Mar. 18, 1892	27	7	1	1892	889,753.50	861,840.83	27,912.67
Salaries.	Mar. 3, 1891	26	1051	1	1893	256,800.00	253,896.30	2,903.70
Collecting agricultural statistics.	July 5, 1892	27	74	1	1893	110,000.00	95,649.21	14,350.79
Botanical investigations and experiments.	do	27	76	1	1893	29,500.00	28,611.88	888.12
Investigating the history and habits of insects.	Mar. 3, 1893	27	737	1	1893	17,800.00	17,290.80	509.20
Investigations in ornithology and mammalogy.	July 5, 1892	27	77	1	1893	15,000.00	14,947.77	52.23
Pomological information.	do	27	77	1	1893	5,000.00	4,745.94	254.06
Microscopical investigations.	do	27	77	1	1893	2,000.00	1,982.98	17.02
Vegetable pathology.	do	27	77	1	1893	20,000.00	19,977.38	22.62

Laboratory.....	do	27	1893	19,400.00	18,002.59	1,397.41
Fiber investigations.....	do	27	1893	5,000.00	4,997.07	2.93
Forestry investigations.....	do	27	1893	12,000.00	11,933.30	66.61
Illustrations and engravings.....	do	27	1893	2,000.00	1,906.73	93.27
Purchase and distribution of seeds.....	do	27	1893	135,400.00	134,908.27	491.73
Document and folding room.....	do	27	1893	2,000.00	1,623.55	376.45
Experimental garden and grounds.....	do	27	1893	28,500.00	28,115.09	384.91
Museum.....	do	27	1893	4,000.00	3,973.67	26.33
Furniture, cases, and repairs.....	do	27	1893	10,000.00	8,931.97	1,068.03
Library.....	do	27	1893	3,000.00	2,535.29	464.71
Postage.....	do	27	1893	5,000.00	3,705.00	1,295.00
Contingent expenses.....	do	27	1893	25,000.00	22,218.19	2,781.81
Experiment stations.....	do	27	1893	20,000.00	18,960.13	1,039.85
Experiments in the manufacture of sugar.....	do	27	1893	20,000.00	19,984.86	15.14
Irrigation investigations.....	do	27	1893	6,000.00	4,930.67	1,069.33
Quarantine stations.....	do	27	1893	15,000.00	12,633.23	2,366.77
Experiments in the production of rainfall.....	do	27	1893	10,000.00	4,979.59	5,020.41
Bureau of Animal Industry.....	do	27	1893	850,000.00	724,496.74	125,503.26
Weather Bureau.....	do	27	1893	913,650.72	890,424.77	23,225.95
Salaries.....	Mar. 3, 1893	27	1894	256,800.00	233,679.75	23,120.25
Collecting agricultural statistics.....	do	27	1894	110,000.00	91,077.40	18,922.60
Botanical investigations and experiments.....	do	27	1894	28,000.00	23,240.83	4,759.17
Investigating the history and habits of insects.....	do	27	1894	20,300.00	16,203.96	4,096.04
Investigations in ornithology and mammalogy.....	do	27	1894	17,500.00	17,450.00	50.00
Pomological information.....	do	27	1894	5,000.00	4,248.99	751.01
Microscopical investigations.....	do	27	1894	2,000.00	1,117.55	882.45
Vegetable pathology.....	do	27	1894	20,000.00	17,576.95	2,423.05
Laboratory.....	do	27	1894	21,300.00	10,426.79	11,473.21
Fiber investigations.....	do	27	1894	5,000.00	2,500.47	2,499.53
Forestry investigations.....	do	27	1894	20,000.00	19,995.96	4.04
Illustrations and engravings.....	do	27	1894	2,000.00	664.79	1,335.21
Purchase and distribution of seeds.....	do	27	1894	135,400.00	119,664.90	15,735.10
Document and folding room.....	do	27	1894	2,000.00	1,662.81	337.19
Experimental garden and grounds.....	do	27	1894	31,500.00	26,616.86	4,883.14
Museum.....	do	27	1894	4,000.00	2,787.22	1,212.78
Furniture, cases, and repairs.....	do	27	1894	10,000.00	8,628.76	1,371.24
Library.....	do	27	1894	3,000.00	2,892.69	1,107.31
Postage.....	do	27	1894	5,000.00	1,375.00	3,625.00
Contingent expenses.....	do	27	1894	25,000.00	20,487.23	4,512.77
Experiment stations.....	do	27	1894	25,000.00	22,381.85	2,618.15
Experiments in the manufacture of sugar.....	do	27	1894	10,000.00	2,997.39	7,002.61
Quarantine stations.....	do	27	1894	20,000.00	9,445.98	10,554.02
Irrigation investigations.....	do	27	1894	6,000.00	5,463.02	536.98
Experiments in the production of rainfall.....	do	27	1894	15,000.00	6,263.92	8,736.08
Bureau of Animal Industry.....	do	27	1894	850,000.00	496,013.17	353,986.83
Weather Bureau.....	do	27	1894	951,100.00	811,200.69	139,899.31

RECAPITULATION.

Fiscal year.	Amount appro- priated.	Amount dis- bursed.	Amount unex- pended.	Fiscal year.	Amount appro- priated.	Amount dis- bursed.	Amount unex- pended.
1839	\$1,000.00	\$1,000.00		1868	\$279,020.00	\$279,094.34	\$1,925.66
1840				1869	172,593.00	172,593.00	
1841				1870	156,440.00	151,506.93	4,843.07
1842	1,000.00	1,000.00		1871	188,180.00	186,876.81	1,303.19
1843				1872	197,070.00	195,977.25	1,092.75
1844	2,000.00	2,000.00		1873	202,440.00	201,321.22	1,118.78
1845	2,000.00	2,000.00		1874	257,690.00	233,765.78	23,924.22
1846	3,000.00	3,000.00		1875	337,880.00	321,079.83	16,800.17
1847	3,000.00	3,000.00		1876	249,120.00	198,843.64	50,276.36
1848	4,500.00	4,500.00		1877	194,086.96	188,206.19	6,480.77
1849	3,500.00	3,500.00		1878	198,640.00	197,634.94	1,005.06
1850	5,500.00	5,500.00		1879	206,400.00	206,360.00	40.00
1851	5,500.00	5,500.00		1880	199,500.00	198,361.72	1,138.28
1852	5,000.00	5,000.00		1881	275,608.31	267,608.84	7,951.47
1853	5,000.00	5,000.00		1882	363,011.05	354,482.39	8,528.66
1854	10,000.00	10,000.00		1883	456,396.11	438,941.72	17,454.39
1855	50,000.00	50,000.00		1884	1,416,641.13	1,413,618.09	3,023.04
1856	30,000.00	30,000.00		1885	655,930.25	558,934.89	99,995.36
1857	75,000.00	75,000.00		1886	1,677,973.22	1,657,973.22	20,000.00
1858	63,530.00	63,537.25	\$342.75	1887	1,657,641.81	1,657,641.81	
1859	60,000.00	60,000.00		1888 ⁶	1,027,219.06	1,011,282.62	15,936.44
1860	40,000.00	40,000.00		1889	1,134,480.60	1,033,590.22	100,890.38
1861	60,000.00	60,000.00		1890	1,170,139.11	971,823.62	198,315.49
1862	63,704.21	63,704.21	295.79	1891	1,372,049.21	1,266,277.36	105,771.85
1863	80,000.00	80,000.00		1892	2,303,655.75	2,253,262.29	50,393.46
1864	199,770.00	189,270.00	10,500.00	1893	2,542,060.72	2,356,563.08	185,497.64
1865	112,304.05	112,196.55	107.50	1894	2,603,500.00	91,977,231.26	9026,268.74
1866	167,787.82	167,787.82		Total	10,19,378,435.68	11,18,022,027.11	121,356,408.57
1867	199,100.00	199,100.00					

¹ Including deficiency appropriation.² Includes \$1,646.45 of the appropriation for reclamation of arid lands carried to the fiscal year 1882.³ Includes \$85.26 of the appropriation for reclamation of arid lands, and \$3,530.85 of the appropriation for experiments in the manufacture of sugar, carried to the fiscal year 1883.⁴ Includes \$7,656.13 of the appropriation for reclamation of arid lands, carried to the fiscal year 1884.⁵ Includes \$93,192.27 of the appropriation for Bureau of Animal Industry, and \$2,970.82 of the appropriation for quarantine stations, carried to the fiscal year 1886.⁶ For the fiscal year 1888 including the sum of \$8,000 appropriated for deficiencies in the appropriation for experiments in the manufacture of sugar for the fiscal years 1887 and 1888, of which \$7,927.50 was disbursed and \$72.50 remained unexpended.⁷ Includes \$12,923.25 of the appropriation for botanical investigations, and \$58,364.76 of the appropriation for experiments in the manufacture of sugar, carried to the fiscal year 1890.⁸ Includes \$188,974.69 of the appropriation for Bureau of Animal Industry, carried to the fiscal year 1891.⁹ There remain unpaid bills amounting to about \$500 chargeable to the appropriation for the fiscal year 1894.¹⁰ This total is the amount actually appropriated for the various fiscal years, with the exception of \$7,604.70 appropriated July 13, 1868, to cover a number of expenditures made in previous years. It does not include an aggregate sum of \$369,344.48 reapportioned from the unexpended balances of several fiscal years. (See foregoing notes.)¹¹ Does not include \$37,004.70 which was disbursed during several years, and covered by an appropriation of like amount, made July 13, 1868. (See note 10.)¹² Does not include an aggregate sum of \$369,344.48 reapportioned from the unexpended balances of several fiscal years. (See foregoing notes.)

REPORT OF THE APPOINTMENT CLERK.

SIR: I have the honor to submit a report upon the number, classification, location, States whence appointed, and salaries of the employees of the Department of Agriculture on October 31, 1895, and the development of the classified civil service therein.

Very respectfully,

J. B. BENNETT,
Appointment Clerk.

Hon. J. STERLING MORTON,
Secretary.

Number of employees, October 31, 1895.

In the entire Department.	Males.	Females.	Total.
Classified service:			
Subject to competitive examination	1,147	338	1,485
Subject to noncompetitive examination	0	0	0
Excepted from examination	3	1	4
Unclassified service:			
Presidential appointees	3	0	3
Laborers and workmen (not including any person designated as a skilled laborer or workman)	437	90	527
Total	1,590	429	2,019
Employees now serving who were appointed through examination and certification under the civil-service rules	132	33	165
Employees who were appointed through examination and certification under civil-service rules from the enactment of the civil-service law, January 16, 1883, to March 6, 1893	70	42	112
Severed by resignation, transfer, etc., from the service during the same period	7	5	12
Employees who were appointed through examination and certification under civil-service rules from March 7, 1893, to October 31, 1895	94	8	102
Severed by resignation, transfer, etc., from the service from March 7, 1893, to October 31, 1895	25	12	37

Of the total number of employees in the Department of Agriculture there are on duty in Washington, D. C., on this date, as follows:

Divisions, offices, and bureaus.	Males.	Females.	Total.
In divisions and offices:			
Subject to competitive examination	196	103	299
Below the classified service, as laborers, charwomen, etc.	48	30	78
Excepted from examination	3	1	4
Appointed by the President	2	.....	2
Total	249	134	383
In the Bureau of Animal Industry:			
Subject to competitive examination	33	9	42
Below the classified service, as laborers, charwomen, etc.	3	2	5
Total	36	11	47
In the Weather Bureau:			
Subject to competitive examination	126	16	142
Below the classified service, as laborers, charwomen, etc.	5	8	13
Appointed by the President	1	.....	1
Total	132	24	156

Number in Washington, D. C.:	
Subject to competitive examination	483
Below the classified service, as laborers, etc	96
Excepted from civil-service examination	4
Appointed by the President	3
Total	586

Of the total number of employees in Washington, D. C., 86 males and 33 females (119 persons) have been appointed through examination and certification by the United States Civil Service Commission, and 269 males and 95 females and the 364 places they occupy have been brought within the competitive grade in the classified civil service by the operation of Presidential orders issued in accordance with an act to regulate and improve the civil service of the United States, approved January 16, 1883, section 6, clause 3.

Statement of the number of persons employed in the Department of Agriculture, the number appointed from each State, Territory, and the District of Columbia, respectively, and the aggregate and per capita amounts of their salaries or compensations on October 31, 1895.

State.	Num- ber.	Salaries.	
		Per annum.	Per capita.
Alabama.....	32	\$14,384	\$449.50
Arkansas.....	22	7,286	331.03
California.....	22	24,760	1,125.45
Colorado.....	6	6,520	1,086.66
Connecticut.....	16	19,908	1,244.25
Delaware.....	6	5,540	923.98
Florida.....	20	10,366	518.30
Georgia.....	44	8,344	189.63
Idaho.....	2	3,000	1,500.00
Illinois.....	256	209,474	818.25
Indiana.....	62	56,232	906.96
Iowa.....	32	32,024	1,000.75
Kansas.....	61	60,796	996.65
Kentucky.....	21	12,842	611.57
Louisiana.....	31	9,331	301.00
Maine.....	21	26,157	1,245.57
Maryland.....	69	75,982	1,101.18
Massachusetts.....	93	73,437	789.64
Michigan.....	82	61,685	752.25
Minnesota.....	20	17,072	853.60
Mississippi.....	32	11,422	356.93
Missouri.....	100	105,102	1,051.02
Montana.....	4	4,800	1,200.00
Nebraska.....	90	92,390	1,026.55
Nevada.....	3	4,700	1,566.66
New Hampshire.....	8	7,560	945.00
New Jersey.....	39	43,470	1,114.61
New York.....	133	143,468	1,078.70
North Carolina.....	47	29,300	623.40
North Dakota.....	4	3,484	871.00
Ohio.....	68	56,316	828.17
Oregon.....	7	6,040	862.85
Pennsylvania.....	94	81,720	869.36
Rhode Island.....	8	5,160	645.00
South Carolina.....	29	6,688	230.62
South Dakota.....	11	9,008	818.90
Tennessee.....	35	25,846	738.45
Texas.....	40	16,288	407.20
Vermont.....	10	10,885	1,088.50
Virginia.....	82	71,046	866.41
Washington.....	12	8,540	711.66
West Virginia.....	23	12,612	548.34
Wisconsin.....	66	43,030	651.96
Wyoming.....	1	1,200	1,200.00
Arizona.....	1	1,800	1,800.00
New Mexico.....	6	6,620	1,103.33
Oklahoma.....	1	720	720.00
Utah.....	5	6,500	1,300.00
District of Columbia.....	141	116,192	824.05
Indian Territory.....	1	36	36.00
Total.....	2,019	1,667,083	.....

Highest per capita, Arizona, \$1,800; lowest per capita, Indian Territory, \$36.